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Report on the individual review of the annual submission of Norway submitted in 2014*

* In the symbol for this document, 2014 refers to the year in which the inventory was submitted, and not to the year of publication.

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I. Introduction and summary

1. This report covers the review of the 2014 annual submission of Norway, coordinated by the UNFCCC secretariat, in accordance with the "Guidelines for review under Article 8 of the Kyoto Protocol" (decision 22/CMP.1) (hereinafter referred to as the Article 8 review guidelines). The review took place from 22 to 27 September 2014 in Bonn, Germany, and was conducted by the following team of nominated experts from the UNFCCC roster of experts: generalist – Ms. Anna Romanovskaya (Russian Federation) and Mr. John Watterson (United Kingdom of Great Britain and Northern Ireland); energy – Mr. Christo Christov (Bulgaria), Ms. Olia Glade (New Zealand), Mr. Audace Ndayizeye (Burundi) and Mr. Daniel Tutu Benefoh (Ghana); industrial processes and solvent and other product use – Ms. Maria José López (Belgium) and Mr. Kiyoto Tanabe (Japan); agriculture – Ms. Penelope Reyenga (Australia) and Mr. Asaye Ketema Sekie (Ethiopia); land use, land-use change and forestry (LULUCF) – Mr. Manuel Estrada (Mexico), Mr. Walter Oyhantcabal (Uruguay) and Ms. Valentyna Slivinska (Ukraine); and waste – Mr. Chart Chiemchaisri (Thailand) and Mr. Gustavo Barbosa Mozzer (Brazil). Mr. Tanabe and Mr. Tutu Benefoh were the lead reviewers. The review was coordinated by Ms. Suvi Monni (UNFCCC secretariat).

2. In accordance with the Article 8 review guidelines, a draft version of this report was sent to the Government of Norway, which provided comments that were considered and incorporated, as appropriate, into this final version of the report. All encouragements and recommendations in this report are for the next annual submission, unless otherwise specified. The expert review team (ERT) notes that the 2013 annual review report of Norway was published after 15 April 2014, which may have affected the Party's ability to implement recommendations and encouragements made in the previous review report.

3. All recommendations and encouragements included in this report are based on the ERT's assessment of the 2014 annual submission against the Article 8 review guidelines. The ERT has not taken into account the fact that Parties will prepare the submissions due by 15 April 2015 using the revised "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual greenhouse gas inventories" adopted through decision 24/CP.19. Therefore, when preparing the next annual submissions, Parties should evaluate the implementation of the recommendations and encouragements in this report, in the context of those guidelines.

4. In 2012, the main greenhouse gas (GHG) emitted by Norway was carbon dioxide (CO_2), accounting for 83.6 per cent of total GHG emissions[1] expressed in carbon dioxide equivalent (CO_2 eq), followed by methane (CH_4) (8.0 per cent) and nitrous oxide (N_2O) (6.1 per cent). Hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF_6) collectively accounted for 2.3 per cent of the overall GHG emissions in the country. The energy sector accounted for 74.3 per cent of total GHG emissions, followed by the industrial processes sector (14.5 per cent), the agriculture sector (8.5 per cent), the waste sector (2.3 per cent) and the solvent and other product use sector (0.3 per cent). Total GHG emissions amounted to 52,757.24 Gg CO_2 eq and increased by 4.5 per cent between the base year[2] and 2012. The ERT concluded that the description in the

[1] In this report, the term "total GHG emissions" refers to the aggregated national GHG emissions expressed in terms of carbon dioxide equivalent excluding LULUCF, unless otherwise specified.

[2] "Base year" refers to the base year under the Kyoto Protocol, which is 1990 for all gases. The base year emissions include emissions from sources included in Annex A to the Kyoto Protocol only.

national inventory report (NIR) of the trends for the different gases and sectors is reasonable.

5. Tables 1 and 2 show GHG emissions from sources included in Annex A to the Kyoto Protocol (hereinafter referred to as Annex A sources), emissions and removals from the LULUCF sector under the Convention and emissions and removals from activities under Article 3, paragraph 3, and, if any, elected activities under Article 3, paragraph 4, of the Kyoto Protocol (KP-LULUCF), by gas and by sector and activity, respectively.

6. Information to be included in the compilation and accounting database can be found in annex I to this report.

Table 1

Greenhouse gas emissions from Annex A sources and emissions/removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol by gas, base year[a] to 2012

			Gg CO_2 eq							*Change (%)*
		Greenhouse gas	*Base year*	*1990*	*1995*	*2008*	*2009*	*2010*	*2011*	*2012*	*Base year–2012*
Annex A sources		CO_2	34 894.99	34 894.99	37 850.53	44 544.38	42 966.20	45 561.45	44 596.36	44 123.19	26.4
		CH_4	4 960.98	4 960.98	5 114.47	4 483.22	4 403.59	4 422.38	4 284.94	4 228.88	–14.8
		N_2O	5 043.56	5 043.56	4 644.38	3 937.22	3 334.13	3 194.39	3 202.71	3 200.11	–36.6
		HFCs	0.05	0.05	80.34	691.95	736.47	914.44	950.21	972.34	1 961 736.4
		PFCs	3 370.40	3 370.40	2 007.96	772.75	376.72	205.08	225.73	172.39	–94.9
		SF_6	2 199.78	2 199.78	607.79	65.40	61.46	75.38	60.72	60.33	–97.3
KP-LULUCF	Article 3.3[b]	CO_2				1 627.41	1 734.52	1 866.30	1 907.40	1 996.55	
		CH_4				0.02	0.00	0.01	0.00	0.00	
		N_2O				13.83	13.69	14.11	14.61	15.82	
	Article 3.4[c]	CO_2	NA			–30 397.67	–32 519.25	–30 345.31	–31 116.24	–30 199.80	NA
		CH_4	NA			5.73	1.05	1.62	0.22	0.09	NA
		N_2O	NA			12.96	12.52	12.34	12.26	12.42	NA

Abbreviations: Annex A sources = source categories included in Annex A to the Kyoto Protocol, KP-LULUCF = land use, land-use change and forestry emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, NA = not applicable.

[a] The base year for Annex A sources refers to the base year under the Kyoto Protocol, which is 1990 for all gases. For activities under Article 3, paragraph 3, of the Kyoto Protocol and forest management under Article 3, paragraph 4, only the inventory years of the commitment period must be reported.

[b] Activities under Article 3, paragraph 3, of the Kyoto Protocol, namely afforestation and reforestation, and deforestation.

[c] Elected activities under Article 3, paragraph 4, of the Kyoto Protocol, including forest management, cropland management, grazing land management and revegetation.

Table 2
Greenhouse gas emissions by sector and activity, base year[a] to 2012

		Gg CO_2eq								*Change (%)*
	Sector	*Base year*	*1990*	*1995*	*2008*	*2009*	*2010*	*2011*	*2012*	*Base year–2012*
Annex A sources	Energy	29 553.47	29 553.47	32 190.34	39 137.84	38 927.88	40 735.48	39 731.15	39 208.19	32.7
	Industrial processes	13 802.98	13 802.98	11 102.08	9 187.14	6 965.42	7 742.88	7 668.07	7 673.65	–44.4
	Solvent and other product use	191.18	191.18	186.74	166.22	147.56	168.37	171.04	177.61	–7.1
	Agriculture	5 058.50	5 058.50	5 056.74	4 765.68	4 578.21	4 490.68	4 521.23	4 503.47	–11.0
	Waste	1 863.64	1 863.64	1 769.57	1 238.04	1 259.51	1 235.70	1 229.18	1 194.32	–35.9
	LULUCF	NA	–10 146.94	–13 396.49	–27 085.49	–29 123.71	–26 770.41	–27 611.96	–26 677.67	NA
	Total (with LULUCF)	**NA**	**40 322.83**	**36 908.97**	**27 409.42**	**22 754.85**	**27 602.71**	**25 708.71**	**26 079.56**	**NA**
	Total (without LULUCF)	**50 469.77**	**50 469.77**	**50 305.46**	**54 494.91**	**51 878.56**	**54 373.12**	**53 320.66**	**52 757.24**	**4.5**
	Other[b]	NA	NA	NA	NA	NA	NA	NA	NA	NA
KP-LULUCF	Article 3.3[c] Afforestation and reforestation				–454.32	–484.45	–505.98	–551.52	–571.44	
	Article 3.3[c] Deforestation				2 095.58	2 232.67	2 386.40	2 473.52	2 583.81	
	Total (3.3)				**1 641.26**	**1 748.21**	**1 880.42**	**1 922.00**	**2 012.38**	
	Article 3.4[d] Forest management				–30 378.98	–32 505.68	–30 331.35	–31 103.76	–30 187.30	
	Article 3.4[d] Cropland management	NA			NA	NA	NA	NA	NA	NA
	Article 3.4[d] Grazing land management	NA			NA	NA	NA	NA	NA	NA
	Article 3.4[d] Revegetation	NA			NA	NA	NA	NA	NA	NA
	Total (3.4)	**NA**			**–30 378.98**	**–32 505.68**	**–30 331.35**	**–31 103.76**	**–30 187.30**	**NA**

Abbreviations: Annex A sources = source categories included in Annex A to the Kyoto Protocol, KP-LULUCF = LULUCF emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, LULUCF = land use, land-use change and forestry, NA = not applicable.

[a] The base year for Annex A sources is the base year under the Kyoto Protocol, which is 1990 for all gases. For activities under Article 3, paragraph 3, of the Kyoto Protocol and forest management under Article 3, paragraph 4, only the inventory years of the commitment period must be reported.

[b] Emissions/removals reported in the sector other (sector 7) are not included in Annex A to the Kyoto Protocol and are therefore not included in national totals.

[c] Activities under Article 3, paragraph 3, of the Kyoto Protocol, namely afforestation and reforestation, and deforestation.

[d] Elected activities under Article 3, paragraph 4, of the Kyoto Protocol, including forest management, cropland management, grazing land management and revegetation.

II. Technical assessment of the annual submission

A. Overview

1. Annual submission and other sources of information

7. The 2014 annual submission was submitted on 10 April 2014; it contains a complete set of common reporting format (CRF) tables for the period 1990–2012 and an NIR. Norway also submitted the information required under Article 7, paragraph 1, of the Kyoto Protocol, including information on: activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, accounting of Kyoto Protocol units, changes in the national system and in the national registry and the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol. The standard electronic format (SEF) tables were submitted on 10 April 2014. The annual submission was submitted in accordance with decision 15/CMP.1.

8. Norway submitted revised emission estimates and additional information on 10 November 2014 in response to the list of potential problems and further questions raised by the ERT (see paras. 29, 45, 55, 66 and 90 below). Norway further submitted revised CRF tables and KP-LULUCF CRF tables on 29 January 2015 because there had been an error in the KP-LULUCF accounting table (see para. 95 below). The values used in this report are those submitted by Norway on 29 January 2015.

9. The list of other materials used during the review is provided in annex II to this report.

2. Questions of implementation raised in the 2013 annual review report

10. The ERT noted that no questions of implementation have been raised in the 2013 annual review report.

3. Overall assessment of the inventory

11. Table 3 contains the ERT's overall assessment of the annual submission of Norway. For recommendations for improvements for specific categories, please see the paragraphs cross-referenced in the table.

Table 3
The expert review team's overall assessment of the annual submission

Issue	*Expert review team assessment*	*General findings and recommendations*
The ERT's findings on completeness		
Annex A sources[a]	Complete	Mandatory: none
		Non-mandatory: "NE" is reported for: C_3F_8, C_4F_{10}, C_5F_{12}, C_6F_{14} and c-C_4F_8 from aluminium production (1990–2001, 2003) while "NO" is reported for these gases for 2002 and 2004–2012
		The ERT encourages the Party to revise the use of notation keys for this category

Issue	*Expert review team assessment*	*General findings and recommendations*
Land use, land-use change and forestry[a]	Complete	Mandatory: none
		Non-mandatory: "NE" is reported for: carbon stock change from living biomass in wetlands remaining wetlands (peat extraction), from dead organic matter in wetlands remaining wetlands and from soils under wetlands remaining wetlands (wooded mires); carbon stock change from living biomass in settlements remaining settlements; CH_4 from drainage of soils and wetlands (organic soils under forest land and wetlands (peatland and flooded lands)); N_2O from drainage of soils and wetlands (wetlands (flooded lands)); and CO_2 emissions from harvested wood products
		The ERT encourages the Party to estimate and report emissions from all non-mandatory categories
KP-LULUCF	Complete	
The ERT's findings on recalculations and time-series consistency		
Transparency of recalculations	Sufficiently transparent	Please see paragraphs 64–66 below
Time-series consistency	Sufficiently consistent	Please see paragraph 78 below for a category-specific finding
The ERT's findings on QA/QC procedures	Sufficient	Norway has elaborated a QA/QC plan and implemented tier 1 QA/QC procedures in accordance with that plan
		Please see paragraph 12 below for general recommendations on QA/QC procedures, and paragraphs 29–30, 55–56, 61, 100 and 102 below for category-specific recommendations
The ERT's findings on transparency	Sufficiently transparent	Please see paragraphs 21, 29–33, 39, 45, 48–49, 59–60, 67, 74, 80 and 82 below for category-specific recommendations

Abbreviations: Annex A sources = source categories included in Annex A to the Kyoto Protocol, ERT = expert review team, KP-LULUCF = land use, land-use change and forestry emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, NE = not estimated, NO = not occurring, QA/QC = quality assurance/quality control.

[a] The assessment of completeness by the ERT considers only the completeness of reporting of mandatory categories (i.e. categories for which methods and default emission factors are provided in the Intergovernmental Panel on Climate Change (IPCC) *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*, the IPCC *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* or the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry*).

12. The ERT noted that there are errors in the inventory that could have been avoided by improved quality control (QC) procedures (see table 3 above and paras. 87–88 below). In

response to a question raised by the ERT during the review, Norway explained that QC is generally the responsibility of the sectoral experts as well as one person who has responsibility for cross-cutting QC in the energy sector. The ERT observed that no single person acted as a QC manager overseeing activities for the compilation and reporting of the whole inventory. The ERT welcomes the information provided by the Party during the review that during 2014 a major review of the compilation of the inventory by Statistics Norway, including QC procedures, will be carried out by an external consultant. The ERT recommends that Norway ensure that sufficient time and resources are made available for QC activities; review the quality assurance/quality control (QA/QC) procedures in place; and consider whether a QC manager overseeing QC activities for the compilation and reporting of the whole inventory would be beneficial.

4. Description of the institutional arrangements for inventory preparation, including the legal and procedural arrangements for inventory planning, preparation and management

Inventory planning

13. The NIR and additional information provided by the Party during the review described the national system for the preparation of the inventory. There were changes to the national system for the 2014 annual submission (see para. 100 below). The single national entity responsible for overseeing the preparation of the national inventory, for QA and for official reporting to the UNFCCC is the Norwegian Environment Agency, while Statistics Norway and the Norwegian Forest and Landscape Institute are also core institutions in the national system. Statistics Norway and the Norwegian Forest and Landscape Institute are the principal contributors to the inventory in their respective sectors. Statistics Norway is responsible for preparing the estimates for all sectors except the LULUCF sector, performing the key category and uncertainty analyses and compiling the CRF tables. The Norwegian Forest and Landscape Institute prepares the estimates for the LULUCF sector and for the KP-LULUCF activities. All three organizations collect activity data (AD) for the inventory preparation process in accordance with their defined responsibilities. The legal basis for data collection and data management is secured mainly through three acts: the Pollution Control Act, the Greenhouse Gas Emission Trading Act and the Statistics Act. The Norwegian Environment Agency has signed agreements with Statistics Norway and the Norwegian Forest and Landscape Institute to ensure that they comply with their responsibilities, which include, in addition to data collection and the calculation of emissions/removals, the implementation of QA/QC and archiving procedures, the provision of documentation, making information available for review, and the delivery of data and information in a timely manner in order to meet the reporting deadlines under the Convention and its Kyoto Protocol.

Inventory preparation

14. Table 4 contains the ERT's assessment of Norway's inventory preparation process.

Table 4
Assessment of inventory preparation by Norway

Issue	*ERT assessment*	*ERT findings and recommendations*
Key category analysis		
Was the key category analysis performed in accordance with the IPCC good practice guidance and the IPCC good practice guidance for LULUCF?	Yes	Level and trend analysis performed, including and excluding LULUCF

Issue	*ERT assessment*	*ERT findings and recommendations*
Approach followed?	Both tier 1 and tier 2	
Were additional key categories identified using a qualitative approach?	Yes	Coal mining and handling (CH_4); carbon dioxide capture and storage reported under venting
Has the Party identified key categories for activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol following the guidance on establishing the relationship between the activities under the Kyoto Protocol and the associated key categories in the UNFCCC inventory?	Yes	
Does the Party use the key category analysis to prioritize inventory improvements?	Yes	
Assessment of uncertainty analysis		
Approach followed?	Tier 1	A tier 2 assessment is conducted periodically (latest reported year 2009)
Was the uncertainty analysis carried out in accordance with the IPCC good practice guidance and the IPCC good practice guidance for LULUCF?	Yes	The uncertainties for AD in the energy sector are low compared with the differences between the sectoral and reference approaches and large statistical differences in the national energy balance (see paras. 23–26 below). During the review, Norway indicated that the major issues identified in the energy balance affect the supply side and therefore the reference, rather than the sectoral, approach. The ERT recommends that Norway provide documentation on the country-specific uncertainty values for AD and a justification why the differences in reference and sectoral approach are not reflected in the uncertainty estimates The trend uncertainty reported in the 2014 annual submission is for 1990–2009. The ERT recommends that Norway update the trend uncertainty analysis annually and report on

Issue	*ERT assessment*	*ERT findings and recommendations*
		it in the NIR
Quantitative uncertainty (including LULUCF)	Level = 18.8% Trend = 7% (1990 to 2009)	
Quantitative uncertainty (excluding LULUCF)	Level = 3.8% Trend = 3% (1990 to 2009)	

Abbreviations: AD = activity data, ERT = expert review team, IPCC good practice guidance = the Intergovernmental Panel on Climate Change (IPCC) *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories*, IPCC good practice guidance for LULUCF = IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry*, LULUCF = land use, land-use change and forestry, NIR = national inventory report.

Inventory management

15. There were no changes to the inventory management process carried out by the Party for the 2014 annual submission, as indicated by the Party in its NIR. The description of the inventory management process, as contained in the report of the individual review of the annual submission of the Party submitted in 2013,[3] remains relevant.

16. The ERT noted that not all the information which is relevant for the inventory is documented and archived (see for example para. 64 below). The ERT noted from the previous review report that Norway had an ongoing project to develop a physical and an electronic library to archive the most important methodology reports, but that at the time of the previous review, the Party had explained that there had been no recent progress on this project. In response to a question raised by the current ERT during the review, the Party indicated that there was a technical problem at the Norwegian Environment Agency which had delayed progress of the library's development. The ERT strongly reiterates the recommendation made in the previous review report that Norway develop this documentation project and ensure that all necessary information on country-specific methods, disaggregated emission factors (EFs), parameters and activity data (AD) is fully documented.

5. Follow-up to previous reviews

17. The ERT noted that Norway has made progress in its efforts to improve the documentation of country-specific methods, disaggregated EFs, parameters and AD since the previous annual submission. Specifically, the ERT notes the improvements in the transparency of the agriculture sector (see para. 59 below) and the waste sector (see para. 81 below). The ERT welcomes these improvements.

18. Recommendations from previous reviews that have not yet been implemented, as well as issues the ERT identified during the 2014 annual review, are discussed in the relevant sectoral chapters of the report and in table 9 below.

[3] FCCC/ARR/2013/NOR, paragraph 13.

B. Energy

1. Sector overview

19. The energy sector is the main sector in the GHG inventory of Norway. In 2012, emissions from the energy sector amounted to 39,208.19 Gg CO_2 eq, or 74.3 per cent of total GHG emissions. Since 1990, emissions have increased by 32.7 per cent. The key drivers for the rise in emissions are increased activities relating to oil and gas extraction (emissions from offshore energy use in oil and gas fields, reported under manufacture of solid fuels and other energy industries) and increased road transportation. Within the sector, 38.7 per cent of the emissions were from transport, followed by 35.9 per cent from energy industries, 8.4 per cent from fugitive emissions from oil and natural gas and 8.3 per cent from other sectors. Manufacturing industries and construction accounted for 7.9 per cent and other (fuel combustion) accounted for 0.7 per cent. The remaining 0.1 per cent was from fugitive emissions from solid fuels.

20. Norway has made recalculations between the 2013 and 2014 annual submissions for this sector. The two most significant recalculations made were in the following categories: transport – CO_2 (decrease of 173.39 Gg, or 1.2 per cent, for 2011); and fugitive emissions from oil and natural gas – CO_2 (increase of 96.14 Gg, or 3.7 per cent, for 2011). The recalculations were made following changes in AD (correction of errors in fuel consumption data, revised data from production plants and the reallocation of emissions between subcategories petroleum refining and venting and flaring). Compared with the 2013 annual submission, the recalculations decreased emissions in the energy sector for 2011 by 97.71 Gg CO_2 eq (0.2 per cent) and decreased total national emissions by 0.2 per cent. The recalculations were adequately explained.

21. The ERT noted that in the NIR (tables 3.7, 3.8 and 3.9) the EFs for CH_4 and N_2O for stationary fuel combustion have been reported on the basis of weight (kg CH_4/t fuel and kg N_2O/t fuel) whereas the energy balance (annex III to the NIR) is reported using the energy unit petajoule (PJ). A similar observation was made in the previous review report.[4] The ERT considers that this reporting lacks transparency. In response to a question raised by the ERT during the review, Norway explained that it plans to report CH_4 and N_2O EFs in energy units in the next NIR. The ERT reiterates the recommendation made in the previous review report that the Party report the CH_4 and N_2O EFs in energy units in the NIR to improve transparency.

2. Reference and sectoral approaches

22. Table 5 provides a review of the information reported under the reference approach and the sectoral approach, as well as comparisons with other sources of international data. Issues identified in table 5 are more fully elaborated in paragraphs 23–30 below.

Table 5
Review of reference and sectoral approaches

Issue	*Expert review team assessment*	*Paragraph cross-references*
Difference between the reference approach and the sectoral approach	Energy consumption: 8.19 PJ, 1.54% CO_2 emissions: 2 304.50 Gg CO_2, 6.57%	

[4] FCCC/ARR/2013/NOR, paragraph 19.

Issue	*Expert review team assessment*	*Paragraph cross-references*
Are differences between the reference approach and the sectoral approach adequately explained in the NIR and the CRF tables?	No	See paras. 23 and 25–26 below
Are differences with international statistics adequately explained?	Yes	See paras. 24 and 26 below
Is reporting of bunker fuels in accordance with the UNFCCC reporting guidelines?	Yes	See para. 27 below
Is reporting of feedstocks and non-energy use of fuels in accordance with the UNFCCC reporting guidelines?	No	See paras. 28–30 below

Abbreviations: CRF = common reporting format, NIR = national inventory report, UNFCCC reporting guidelines = "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories".

Comparison of the reference approach with the sectoral approach and international statistics

23. Norway has reported the difference in the CO_2 emissions for the reference and sectoral approaches: it varies from –9.7 to 50.8 per cent for the period 1990–2012. The greatest differences for CO_2 occur in 1999–2001 and in 2004–2006. For 2012, the difference for CO_2 is 6.6 per cent. The differences in 2008–2012 are 6.6–21.9 per cent, and these differences have been noted in previous review reports. Except for a few years (1990, 1993, 1996 and 2007) the reference approach produces higher emission estimates than the sectoral approach indicating that the inventory could be underestimated for most years. The previous review report included recommendations that Norway: (1) describe in detail, in the NIR, the findings of the projects relating to the improvement of the energy statistics and the reduction of statistical differences in the energy balance as well as any further actions needed to reduce the differences between the reference and sectoral approaches; (2) further improve the accuracy of the data collection procedures for oil and gas production, processing and export in order to further reduce the level of difference between the sectoral and reference approaches; and (3) transparently and comprehensively report on the outcomes of the QC checks carried out for both the reference and the sectoral approaches to ensure that the action plan developed in response to the potential problem identified in the 2012 annual submission is resolved. In its 2014 annual submission, Norway reported in the NIR that the large differences primarily result from statistical differences in the energy balance. Norway also reported in the NIR that in an effort to address the persistent large differences, in 2012/2013 the Party carried out a project, led by Statistics Norway in collaboration with the Norwegian Environment Agency, to investigate the cause for the large statistical differences in the energy balance. As a result of the project, a new data set has been compiled and this led to the detailed energy balance. Norway also reported (NIR, annex XII) on QC activities carried out for the reference and sectoral approaches in 2013–2014. Nevertheless, the ERT noted that the differences still remain in the 2014 annual submission (see para. 26 below).

24. The ERT noted that values for crude oil production and export of liquid fuels reported in CRF table 1.A(b) are higher for several years compared with those reported to the International Energy Agency (IEA). For example, crude oil production in 2012 in the CRF tables (3,396,964.75 TJ) is 4.9 per cent higher than the value reported to IEA (3,238,147.57 TJ), and total export of liquid fuels in the CRF tables (3,526,145.23 TJ) is 5.5 per cent higher than that reported to IEA (3,343,391.83 TJ) in 2012. In response to a

question raised during the earlier stages of the review, Norway explained that the figures reported to IEA are based mainly on the energy balance of Norway, but also on underlying, more detailed statistics. The Party further explained that as the energy balance does not have all the same details and aggregates as the IEA figures, it cannot be used directly for all IEA reporting and this fact may cause some differences between the two sets of reported statistics. The Party mentioned that Statistics Norway has an ongoing project to develop a new technical solution for the energy balance, and the data from the new solution are intended to be compatible with IEA reporting, thus strongly linking the energy balance and IEA reporting.

25. The ERT noted unusually large differences between the reference and sectoral approaches for energy consumption from solid fuels in 2012 (87.3 per cent) and CO_2 emissions from solid fuels in 2012 (66.5 per cent) and large inter-annual variations in these differences. In response to a question raised by the ERT during the review, Norway explained that solid fuels were not prioritized in the projects referred to in paragraph 23 above because the differences in absolute terms have been much smaller for solid fuels than for liquid and gaseous fuels. Norway also explained that production and export of fuels are large relative to domestic consumption, and therefore any improvements in the reference approach are unlikely to affect the sectoral approach.

26. The ERT recommends that Norway continue its work to analyse the reasons for the differences between the reference and sectoral approaches and between the inventory and IEA statistics. The ERT also strongly reiterates the recommendation made in the previous review report that Norway continue to improve the accuracy of the data collection procedures for liquid and gaseous fuels (which are the main fuel types used in Norway) in order to further reduce the level of difference between the sectoral and reference approaches. The ERT also strongly recommends that Norway improve the data collection procedures for solid fuels (coal and coke oven coke) in order to reduce the statistical differences in the energy balance.

International bunker fuels

27. The ERT noted inter-annual variations and differences in the AD in aviation and marine bunkers compared with the data reported to IEA. For example, in 2012, the fuel consumption for marine bunkers reported in CRF table 1.C (20,563.82 TJ) is 51.4 per cent higher than the fuel consumption reported to IEA (13,584.83 TJ). In response a question raised during the earlier stages of the review, Norway provided the response referred to in paragraph 24 above; that is, as the energy balance does not have all the same details and aggregates as the IEA figures, it cannot be used directly for all IEA reporting and this fact may cause some differences between the two sets of reported statistics. The ERT encourages Norway to further investigate and explain the differences in the NIR.

Feedstocks and non-energy use of fuels

28. In CRF table 1.A(d), Norway reported amounts of fuels used for non-energy purposes for lubricants (1,487.03 TJ in 2012) and gas/diesel oil (0.23 TJ in 2012). The reported fraction of carbon stored is 0.8 for lubricants (1990–2012) and 0.5 for gas/diesel oil (1993–2012), whereas the associated CO_2 emissions and "allocated under" in CRF table 1.A(d) are reported as "NE" (not estimated). In response to a question raised by the ERT during the review, Norway reported that emissions from lubricants and feedstock use of gas/diesel oil and residual fuel oil are currently not reported in the CRF tables. The ERT considered that this leads to a potential underestimation of emissions from the sectoral approach, and included the issue in the list of potential problems and further questions raised by the ERT.

29. In response to the list of potential problems and further questions raised by the ERT, Norway submitted revised estimates for CO_2, CH_4 and N_2O emissions from feedstocks and

non-energy use of lubricants, gasoline, residual fuel oil and gas/diesel oil for the entire time series and reported the emissions under category other – stationary. For lubricants, Norway used the default EFs from the Intergovernmental Panel on Climate Change (IPCC) *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the Revised 1996 IPCC Guidelines) as recommended by the ERT: 73.33 t CO_2/TJ (table 1-1), 10.00 kg CH_4/TJ (table 1-7) and 0.60 kg N_2O/TJ (table 1-8). For gasoline, residual fuel oil and gas/diesel oil Norway used the CO_2 EFs provided in the NIR table 3.4 (3.13–3.20 t CO_2/t fuel), and for CH_4 and N_2O the Party used the highest EFs that are used in the inventory for stationary combustion (9.1–9.9 kg CH_4/TJ and 0.68–0.74 kg N_2O/TJ). The revision resulted in a 21.94 Gg CO_2 eq (0.06 per cent) rise in emissions in the energy sector in 2012. However, the ERT noted that Norway did not correct the reporting in CRF table 1.A(d), in which "associated CO_2 emissions" and "allocated under" are reported as "NE" for lubricants and gas/diesel oil and "NO" (not occurring) for gasoline and residual fuel oil. The ERT recommends that the Party document in the NIR the approach used to provide revised estimates and report in CRF table 1.A(d) where the emissions are included in order to ensure transparency. The ERT also recommends that the Party improve QC procedures to ensure consistency of the information reported in different CRF tables.

30. Norway reported in CRF table 1.A(d) (column "allocated under") that the emissions from feedstocks and non-energy use of fuels from liquefied petroleum gas (LPG), coal and petroleum coke are reported under several subcategories of the chemical industry, metal production and other production in the industrial processes sector. However, the ERT considered that there is a lack of transparency regarding the fuel amounts used in different subcategories and the estimated CO_2 emissions from feedstocks and non-energy use of fuels per category. In response to a question raised by the ERT during the review, Norway explained that because of confidentiality requirements, detailed data could not be provided. The ERT also noted that Norway reported in CRF table 1.A(d) the fraction of carbon stored for LPG, coal, petroleum coke and natural gas as 1.00, indicating that there are no associated CO_2 emissions from feedstock and non-energy use of these fuels, even though the Party had reported the categories under which such emissions are included. The ERT recommends that Norway review and revise the reporting in CRF table 1.A(d) and improve QC procedures to ensure consistency of the reporting. The ERT also reiterates the strong recommendation made in the previous review report that Norway provide in the NIR, for fuels for which fraction of carbon stored is smaller than 1.00, balances showing that all non-energy use of fuels is accounted for under the industrial processes sector in order to improve transparency.

3. Key categories

Stationary combustion: gaseous and solid fuels – CO_2

31. The ERT noted that the CO_2 implied emission factor (IEF) for gaseous fuels for public electricity and heat production is constant for 1997 to 2006 (56.06 t/TJ), and inter-annual changes occur thereafter. For example, the IEF increased by 3.9 per cent from 56.06 t/TJ in 2008 to 58.23 t/TJ in 2009. Other large inter-annual changes include between 2006 and 2007 (+3.1%) and between 2007 and 2008 (–3.0%). The values reported for 2009–2011 (57.92–58.23 t/TJ) are among the highest values of all reporting Parties for these years (49.13–60.76 t/TJ). In response to a question raised during the earlier stages of the review, Norway explained that the total consumption of gas varies significantly from year to year primarily as a result of the economics of gas power production. Thus, the relative contributions of plants with different plant-specific EFs (i.e. values taken from the European Union Emissions Trading System (EU ETS) reports) also vary significantly. This accounts for the changes in the time series. The ERT considers the explanation from the Party to be sufficient and recommends that the Party provide the above information in the NIR to improve transparency.

32. The ERT noted inter-annual changes in the CO_2 IEF for solid fuels in public electricity and heat production. The IEF increased from 91.33 t/TJ in 2010 to 94.65 t/TJ in 2010 (3.6 per cent) and decreased by 4.1 per cent from 2011 to 2012. The IEFs for all years of the time series except 2011 are below the default EF range (94.60–106.70 t/TJ) provided in the Revised 1996 IPCC Guidelines. In response to a question raised during the earlier stages of the review, the Party explained that most of the emissions in this category are from coal use at Svalbard. The coal has a low EF of 89.68 t/TJ. In addition, there is some use of blast furnace gas, for which a plant-specific EF of 139 t/TJ is used. The IEF fluctuates as a result of the varying amounts of blast furnace gas. The ERT considers the explanation provided by the Party to be sufficient and recommends that the Party provide the above information in the NIR to improve transparency.

33. The CO_2 IEFs for solid fuels in the subcategory chemicals for the entire time series except 1991 (212.97–263.95 t/TJ) are the highest of all reporting Parties (17.39–263.95 t/TJ). They are also above the default EF range (94.60–106.70 t/TJ) provided in the Revised 1996 IPCC Guidelines. In response to a question raised during the earlier stages of the review, Norway explained that the emissions are from blast furnace gas sold by ferroalloy plants, which has a high EF. The ERT recommends that the Party provide this explanation in the NIR to improve transparency.

Road transportation: liquid and gaseous fuels – CH_4 and N_2O[5]

34. The previous review report noted that Norway uses a bottom-up model to estimate CH_4 and N_2O emissions from road transportation and that the fuel consumption estimated using the bottom-up approach is not scaled to match the registered fuel sales. The previous review report also noted that the Party does not report the difference between fuel sales and bottom-up estimates, which does not allow evaluation of the accuracy of the emission estimates. The previous review report included a recommendation that Norway either scale up the fuel estimated by the model or report the figures for fuel sold and fuel estimated. The present ERT noted that Norway has expanded the discussion of this matter in its NIR (section 3.2.5.5) and stated in the NIR that assessment of the quality of the data used in the bottom-up model is required to determine whether or not emissions should be scaled with fuel consumption. The ERT recommends that Norway carry out such assessment of data quality and reiterates the recommendation made in the previous review report that Norway scale the bottom-up estimates to match fuel sales, if appropriate.

Oil and natural gas: liquid and gaseous fuels – CO_2 and CH_4

35. Norway has reported the AD for oil exploration and for natural gas exploration, transmission, distribution and other leakage at industrial plants and power stations as "NE" for the entire time series, whereas the CO_2 and CH_4 emissions have been either reported or indicated as "IE" (included elsewhere). In response to a question raised during the earlier stages of the review, Norway indicated that it will reconsider the use of notation keys and, if appropriate, change the notation keys for AD to "IE". The ERT recommends that Norway carry out the planned review of notation keys.

C. Industrial processes and solvent and other product use

1. Sector overview

36. In 2012, emissions from the industrial processes sector amounted to 7,673.65 Gg CO_2 eq, or 14.5 per cent of total GHG emissions, and emissions from the solvent and other

[5] N_2O emissions from this category are not key. However, since all issues related to this category are discussed as a whole, the individual gases are not assessed in separate sections.

product use sector amounted to 177.61 Gg CO_2 eq, or 0.3 per cent of total GHG emissions. Since base year, emissions have decreased by 44.4 per cent in the industrial processes sector, and decreased by 7.1 per cent in the solvent and other product use sector. The key drivers for the fall in emissions in the industrial processes sector are: the reduction in PFC emissions from aluminium production owing to technology improvements; the decrease in CO_2 emissions from both silicon and calcium carbide production owing to the closure of plants in 2006 and 2003, respectively; and the reduction in SF_6 emissions from aluminium and magnesium foundries as a result of ceasing the production of primary magnesium in 2002 and the casting of magnesium in 2006. In addition, an agreement between the Ministry of the Environment and the users and producers of gas-insulated switchgears (electrical equipment) to reduce SF_6 emissions, together with a significant reduction in N_2O emissions from nitric acid production as a result of the use of abatement technology, contributed to the decreasing emission trend. Within the industrial processes sector, 56.3 per cent of the emissions were from metal production, followed by 14.3 per cent from the chemical industry, 13.5 per cent from consumption of halocarbons and SF_6 and 12.9 per cent from mineral products. Other production (i.e. pulp and paper, food and drink) accounted for 2.3 per cent and other (industrial processes) (i.e. paraffin wax) accounted for 0.7 per cent of the emissions from the industrial processes sector. Production of halocarbons and SF_6 was reported as "NA, NO" (not applicable, not occurring).

37. Norway has made recalculations between the 2013 and 2014 annual submissions for the industrial processes sector. The most significant recalculations made by Norway between the 2013 and 2014 annual submissions were in mineral products and ferroalloys production following the inclusion of CO_2 emissions from two plants producing lightweight expanded clay aggregate (leca) and an update of the reported CO_2 emissions from a ferroalloy producer. Compared with the 2013 annual submission, the recalculations increased emissions in the industrial processes sector by 21.00 Gg CO_2 eq (0.3 per cent) and had a negligible impact on total national emissions. The recalculations were adequately explained. The ERT commends Norway for improving the completeness of its inventory by including emissions from the leca producers.

2. Key categories

Cement production – CO_2

38. Cement is produced in two plants in Norway. The Party reports in the NIR (page 190) that the plant-specific EFs used for cement production prior to the start of the EU ETS were 0.530 and 0.541 t CO_2/t clinker. The ERT noted that the IEFs for 1998–2004 are within the range of plant-specific EFs reported by the Party, while the IEFs for the years 1990–1997 (0.510–0.522 t CO_2/t clinker) are significantly lower. Further, the ERT noted that between 2009 (0.551 t CO_2/t clinker) and 2010 (0.526 t CO_2/t clinker) the IEF decreased by 4.5 per cent. The ERT noted that Norway has implemented the recommendation made in the previous review report that it provide more detailed information in its NIR on the method used to calculate the EF and the reason behind the fluctuation of IEFs. In addition, during the review, Norway provided to the ERT the EU ETS verification reports for the two cement plants for 2010. The ERT commends Norway for the additional clarifications, the material provided during the review week and for implementing the recommendation made in the previous review report.

Ammonia production – CO_2

39. The CO_2 IEF and AD for ammonia (NH_3) production show large inter-annual variations; for example, from 1996 to 1997 (a 21.9 per cent increase in the IEF from 1.47 to 1.80 t/t and a 10.4 per cent decrease in production from 415.36 to 372.13 kt), from 1997 to 1998 (a 16.2 per cent decrease in the IEF and a 35.0 per cent decrease in production), from 2002 to 2003 (a 13.9 per cent increase in the IEF and a 5.6 per cent increase in production)

and from 2003 to 2004 (a 10.9 per cent decrease in the IEF and an 18.7 per cent increase in production). In response to a question raised by the ERT during the review, Norway explained that the IEF varies because of the varying mix of gases used in the production process, and that the plant does not have data on the distribution of the gases for the whole time series. Norway also informed the ERT that since the review week, a reason for the inter-annual changes for 2002–2003 and 2003–2004 had been revealed, and that emissions for 2003 will be recalculated accordingly in the next annual submission. The Party also informed the ERT that new data are not available for the earlier years in the time series. The ERT recommends that Norway carry out the planned recalculation, provide the information above on the mix of gases in its NIR to improve transparency and to the extent possible further investigate the reasons for the other inter-annual changes.

Aluminium production – CO_2

40. The CO_2 IEF for aluminium production decreased by 5.7 per cent from 2010 to 2011 (from 1.59 to 1.50 t/t). In response to a question raised by the ERT during the review, Norway explained that the decrease resulted from a technological problem at a plant that produced about 18 per cent of the total aluminium in 2010. This plant uses the pre-baked anode technology and its CO_2 IEF in 2010 was unusually high compared with the other years of the time series because, owing to production problems at the plant in 2010, the consumption of anodes per tonne of aluminium produced was 22 per cent higher than in 2009. The ERT recommends that Norway justify the change in the CO_2 IEF in its NIR.

Consumption of halocarbons and SF_6 – HFCs and PFCs[6]

41. In CRF table 2(I) Norway reports actual PFC emissions as "NA, NO" and potential emissions as negative numbers for the period 2009–2012, assuming that only a destroyed amount for perfluoropropane (C_3F_8) occurs (CRF table 2(II)). The Party uses a model to estimate emissions that takes into account imports, exports and destruction, and data for imports, exports and destruction come from different sources (data for imports and exports are from the registers of the Norwegian Directorate of Customs and Excise and data for destruction are from the relevant company). The NIR states that as a result of high taxation, the use of PFCs in products has been very low and no emissions are reported for the last three years of the time series. However, the NIR also states that some C_3F_8 has been used as a commercial cooling agent. The ERT noted that as PFCs are shown to be destroyed, emissions from stocks would have been expected. The ERT strongly recommends that Norway either estimate PFC emissions from refrigeration for 2009–2012 or justify that "NO" is the appropriate notation key for actual emissions of PFCs. The ERT also encourages Norway to enhance the QA/QC procedures of the AD and the model used to estimate emissions of HFCs and PFCs from product use in Norway.

42. For commercial refrigeration, Norway reported "NO" in CRF table 2(II).F for the amount of fluid filled in new manufactured products during the entire time series for hydrofluorocarbon (HFC)-143 except in 2005 and 2006 (8.48 t) and for HFC-134 except in 2004 and 2008 (17.52 t). The ERT also noted that CRF table 2(II) shows bulk imports for HFC-134 (reported as 18.2 t in 2008, "NO" in 2009, 0.012 t in 2010, 0.0037 t in 2011 and 0.0036 t in 2012). During the review, the ERT asked Norway to clarify the reasons why it reports the use of HFC-143 and HFC-134 for filling new manufactured products for only two years. In response, the Party stated that HFC-134 is not used regularly in Norway and that the imports of HFC-134 could relate to either trial use or misclassification of HFC-134a. The ERT strongly recommends that Norway investigate whether the reported amount is a misclassification or a real use and correct the information and the data accordingly. The

[6] PFC emissions from this category are not key. However, since all issues related to this category are discussed as a whole, the individual gases are not assessed in separate sections.

ERT reiterates the strong recommendation made in the previous review report that the Party either justify that "NO" is the appropriate notation key for HFC-134 or estimate HFC-134 emissions from filling for 2008 and onwards. The ERT also encourages Norway to enhance the QA/QC procedures of the AD, the model and the resulting estimates of HFCs from refrigeration.

43. Because of confidentiality restrictions, Norway reports HFC emissions from foam blowing, fire extinguishers, aerosols/metered dose inhalers (MDI) and solvents using the notation key "IE", and aggregates them under "other applications using ODS substitutes" rather than disaggregating them by substance. According to paragraph 27 of the "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines" (hereinafter referred to as the UNFCCC reporting guidelines), emissions should be reported at the most disaggregated level for each category, taking into account that a minimum level of aggregation may be required to protect confidential information. The ERT considers that the NIR is not fully transparent for these categories, as the information provided mainly refers to the total actual emissions of HFCs, PFCs and SF_6. The ERT noted that, in Norway, the HFC emissions reported under "other applications using ODS substitutes" represent around 5 per cent of total HFC emissions in 2011–2012 under consumption of halocarbons and SF_6, while in Parties with similar circumstances (e.g. Ireland and Denmark) the share of the aggregated categories ranges between 12 and 15 per cent of total HFC emissions. During the review, the ERT asked Norway to provide the ERT with disaggregated information in accordance with the provisions for review of confidential information (decision 22/CMP.1, annex, paragraph 9). However, the Party responded that the Statistics Act (domestic law) in Norway prohibits the submission of confidential data to external bodies and Statistics Norway concluded that its obligations of confidentiality cannot be ensured if sensitive information is sent out of the premises of Statistics Norway. The ERT therefore requested the Party to provide explanations of the trends in relative values, as well as the methods, assumptions and the EFs for each category. The Party explained that the individual trends cannot be given, as the confidentiality rules that apply to Statistics Norway apply to the trend as well as the level and that the method is documented in the report by Bjønness (2013).[7] However, the ERT noted that this document does not explain the trends, species, specific assumptions and so on in each of the categories identified above (foam blowing, fire extinguishers, aerosols/MDI and solvents).

44. The ERT concluded that this lack of transparency is not in line with the UNFCCC reporting guidelines and the Article 8 review guidelines and does not allow the ERT to confirm whether the reported estimates are accurate and in accordance with the IPCC *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* (hereinafter referred to as the IPCC good practice guidance). Further, recognizing that other Parties with similar circumstances report a larger share of emissions from these categories, the ERT concluded that there could be an underestimation of emissions and included this issue in the list of potential problems and further questions raised by the ERT.

45. In response to the list of potential problems and further questions raised by the ERT, Norway provided the range of emissions in terms of CO_2 eq per capita for the most significant subcategories and species: hard foam (HFC-134a and HFC-152a from stocks), fire extinguishers (HFC-125, HFC-134a and HFC-227ea from stocks and disposal) and MDI (HFC-134a from stocks) compared with data for selected comparable countries (Austria, Denmark, Finland, Ireland, Sweden, United Kingdom of Great Britain and

[7] *Emissions of HFCs and PFCs from Product Use in Norway: Documentation of Methodologies.* Available at <http://www.ssb.no/natur-og-miljo/artikler-og-publikasjoner/_attachment/126338?_ts=13f85bebb88>.

Northern Ireland and United States of America). The ERT agreed with the approach used to demonstrate that emissions have not been underestimated. However, the ERT noted that transparency can be further improved and recommends that the Party provide more transparent information for each category (foam blowing, fire extinguishers, aerosols/MDI and solvents) to demonstrate the accuracy of the reported emissions in its NIR (for instance, by explaining the use of the fluorinated gas (F-gas) species by category and the level of emissions per capita and trends compared with other Parties with similar national circumstances).

3. Non-key categories

Limestone and dolomite use – CO_2

46. Norway states in the NIR (page 194) that the emissions under this category are from three plants which report emissions from limestone and dolomite use. The NIR (table 4.5) presents uses of limestone and dolomite in Norway, showing the allocation of emissions under the CRF categories where the limestone and dolomite are used (cement and lime production, limestone and dolomite use, production of ferroalloys and glass production). The NIR also states that Norway has no information that flue gas desulphurization is used in Norway.

47. The ERT noted that limestone flue gas desulphurization is, to date, the most widely used technology to reduce SO_2 emissions, and therefore the ERT considered that some evidence for other technologies, measures or drivers responsible for the reduction of SO_2 emissions in Norway is required to justify that a potential use of limestone is not missing in the inventory. In response to a question raised by the ERT during the review, Norway explained that the reasons for the decrease in SO_2 emissions are closures of some industrial plants, increasingly strict requirements on the sulphur content of various oil products, the introduction of an SO_2 tax and requirements for industry to reduce its emissions. In Norway, the industry primarily uses the seawater scrubbing technology and it does not use limestone flue gas desulphurization. The ERT encourages the Party to include more information in the NIR in order to justify that flue gas desulphurization is not used and increase transparency regarding whether the uses included in table 4.5 of the NIR include all limestone and dolomite use (see also para. 48 below).

48. In order to increase transparency, the FRT strongly recommends that Norway elaborate a mass balance of the limestone and dolomite used in the country, including imports, exports and details of the various uses, to justify that all potential uses of carbonates are taken into account and the corresponding CO_2 emissions are reported.

49. In response to a question raised by the ERT during the review on the decrease of the CO_2 IEF by 11.2 per cent from 1996 (0.53 t/t) to 2012 (0.47 t/t), Norway explained that the emissions reported under this category include minor emissions (in the range of 1,500 to 4,200 tonnes CO_2 per year) from the use of clay at the brick producing plant. The use of clay has decreased since 1996 and this explains the overall decrease in the IEF for limestone and dolomite use as a whole. During the review, Norway provided the time series for the CO_2 IEF with and without clay and the ERT noted that the CO_2 IEF for limestone and dolomite use is more stable when the emissions from the clay are excluded. The ERT recommends that Norway provide this information in its NIR to justify the trend in the IEF and to improve transparency.

Soda ash production and use – CO_2

50. According to the NIR (pages 195 and 196), soda ash is used and reported in several categories in Norway. Table 4.6 of the NIR shows the total balance for the use of soda ash for the period 1990–2012 and states in which categories Norway reports these emissions in addition to the category soda ash use: soda ash used in glass wool production is reported

under other (mineral products) (see para. 56 below) and soda ash used in nickel production is reported under other (metal production). According to page 196 of the NIR, some soda ash is used in the chemical industry, where consumption is assumed to be non-emissive. The CO_2 emissions reported in the Party's inventory for the category soda ash use are based on the difference between imports, exports, soda ash uses in glass wool and nickel production and consumption in the chemical industry.

51. In response to a question raised by the ERT during the review, the Party could not provide additional information on the uses of soda ash in the chemical industry and therefore did not demonstrate that the uses are non-emissive. The ERT therefore included this issue in the list of potential problems and further questions raised by the ERT.

52. In addition, as explained in the previous review report[8] and in the NIR, Norway uses the default EF of 0.41492 t CO_2/t soda ash from the *2006 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the 2006 IPCC Guidelines) to estimate emissions from the category soda ash use. In response to a question raised by the ERT during the review week regarding a justification for the use of this EF, the Party was not able to provide evidence to confirm that the EF used better reflects the national circumstances than the default provided in the Revised 1996 IPCC Guidelines (page 2.13) (0.415 t CO_2/t soda ash). In addition, the IEF for 2011 is 0.41622 t CO_2/t soda ash, whereas it is 0.41492 for other years. The Party did not provide any explanations for this inter-annual variation. The ERT also noted in the NIR (page 231) that the default EF from the Revised 1996 IPCC Guidelines was used for soda ash use in nickel production and no explanation for the use of different EFs in different categories was provided.

53. In response to a question raised by the ERT during the review, Norway provided a balance of soda ash use. However, the ERT noted that the AD used for the years 1990 and 1991 were different from those reported in the CRF tables and the NIR. The Party confirmed that the wrong values were provided in the CRF tables and the NIR for these two years.

54. The ERT concluded that the estimates provided are not in line with the Revised 1996 IPCC Guidelines and the UNFCCC reporting guidelines, as the EF from the 2006 IPCC Guidelines is used without justification, and therefore this issue was included in the list of potential problems and further questions raised by the ERT.

55. In response to the list of potential problems and further questions raised by the ERT, Norway provided revised estimates (on 10 November 2014) for CO_2 emissions from soda ash production and use, assuming that all soda ash use is emissive, correcting the errors in AD in the years 1990 and 1991 and using the EF from the Revised 1996 IPCC Guidelines. The ERT agreed with the revised estimates, which resulted in a decrease in emissions from soda ash use of 6.07–7.87 Gg CO_2 a year (39.8–47.9 per cent) in the period 1990–1991 and an increase in emissions of up to 1.53 Gg CO_2 a year in the period 1992–2012 (0.14 Gg CO_2 in 2012). The ERT recommends that Norway explain the methodology and data sources used to prepare revised estimates in the NIR. The ERT further recommends that the Party improve its QC procedures to rectify errors in AD and emission factors.

Other (mineral products) – CO_2

56. Norway reported in the NIR (page 198) that it used the default EF of 0.41492 t CO_2/t for soda ash from the 2006 IPCC Guidelines to estimate emissions from glass wool production. The ERT considered that the use of this EF was not justified (see para. 52 above) and included the issue in the list of potential problems and further questions raised by the ERT. In response to the list of potential problems and further questions raised by the

[8] FCCC/ARR/2013/NOR, paragraph 51.

ERT, Norway explained that glass producers provide the estimates by using the default EF of 0.415 t CO_2/t soda ash from the Revised 1996 IPCC Guidelines, so the information presented in the NIR is incorrect. The ERT recommends that Norway correct the error in the NIR and improve the QC procedures for the inventory to avoid such errors.

D. Agriculture

1. Sector overview

57. In 2012, emissions from the agriculture sector amounted to 4,503.47 Gg CO_2 eq, or 8.5 per cent of total GHG emissions. Since 1990, emissions have decreased by 11.0 per cent. The key driver for the fall in emissions is a reduction in the number of cattle and a reduction in inputs of synthetic fertilizers to agricultural soils. Within the sector, 46.8 per cent of the emissions were from agricultural soils, followed by 45.3 per cent from enteric fermentation, 7.8 per cent from manure management and 0.1 per cent from field burning of agricultural residues.

58. Norway has made recalculations between the 2013 and 2014 annual submissions for this sector. The recalculations were in the following categories: enteric fermentation, manure management and agricultural soils. The recalculations were primarily made as a result of changes to the AD and the methods for estimating CH_4 emissions from manure. Compared with the 2013 annual submission, the recalculations decreased emissions in the agriculture sector by 47.42 Gg CO_2 eq (1.0 per cent), and decreased total national emissions by 0.1 per cent. The recalculations were generally adequately explained (see paras. 64–66 below).

59. The ERT commends Norway for implementing a number of the recommendations made in the previous review report, which have helped to improve the transparency of the annual submission. The improvements include: the provision of additional information on how the annual animal numbers are derived; the provision of key parameters for the calculation of gross energy intake; and greater consistency between values reported in the CRF tables and the NIR. To further improve transparency the ERT recommends that additional information be provided in the NIR on the method used to estimate the number of heifers for replacement, and that the key calculation parameters for cattle less than one year old be included in table 6.5 of the NIR.

60. Norway uses a country-specific model to calculate NH_3 emissions from manure management. The explanations in the NIR of the calculation of nitrogen (N) inputs, losses and flows between the manure management and agricultural soils categories are not sufficiently transparent. The ERT reiterates the recommendation made in the previous review report that Norway improve the description of the N flow model, perhaps by including a diagram of the flows, in the NIR.

61. The ERT reiterates the recommendation made in the previous review report that Norway improve QC of the CRF tables and NIR and recommends that the following issues be addressed in the NIR and CRF tables: (1) correct the animal waste allocations in CRF table 4.B(a); (2) report the average N excretion in CRF table 4.B(b) and climate allocation in CRF table 4.B.(a) for "other livestock"; and (3) correct the NH_3 EFs for "other livestock" in NIR table 6.14.

2. Key categories

Enteric fermentation – CH_4

62. Norway applies a country-specific tier 2 method to estimate enteric fermentation emission from cattle. The NIR states that to develop the country-specific methane

conversion rate (Ym), a matrix of intakes was first generated reflecting the range of forage types, milk yields, live weights and weight gain of animals in Norway. These data were then entered into two CH_4 equations (Mills et al., 2003; Kirchgessner et al., 1995[9]) to develop a range of possible CH_4 emissions. Taking the average of the resulting CH_4 emissions, Norway reanalysed the data to develop simpler equations for estimating Ym based on milk yield and the proportion of concentrates in the diet for dairy cattle, and slaughter weight and age for non-dairy cattle. The ERT noted that the resulting Ym (average of 6.9 per cent for mature dairy cattle, 9.1 per cent for mature non-dairy cattle and 10.9 per cent for young cattle in 2012) are higher than the default (6.0 per cent) in the IPCC good practice guidance (table 4.8) and among the highest values of all reporting Parties. This difference is greatest for the mature non-dairy cattle (all other reporting Parties except one report Ym values between 6.0 and 6.5 per cent for mature non-dairy cattle).

63. In response to a question raised by the ERT during the review, Norway provided the study by Mills et al. (2003). The ERT noted that the study is based on dairy cattle with dry matter (DM) intakes ranging from about 9 to 28 kg DM/day. Based on the gross energy intakes reported in NIR table AX-6, the ERT noted that the DM intake of beef cows will probably be at the low end of the range used in the study of Mills et al. (2003), while the intakes of young animals are likely to be outside the range. It is possible, therefore, that the relationship described by Mills et al. (2003) does not accurately estimate emissions for young animals and contributes to the very high Ym generated using the Party's methodology. The ERT encourages Norway to review the method for estimating Ym for young cattle and investigate further the suitability of the equations developed by Mills et al. (2003) and Kirchgessner et al. (1995) for estimating emissions from young animals in order to ensure accuracy.

64. In previous annual submissions, Norway has reported enteric fermentation emissions from poultry using a country-specific EF of 0.00002 t CH_4/animal/year for hens and turkeys. In the 2014 annual submission, Norway made a recalculation and replaced the entire time series with the notation key "NO". In response to a question raised by the ERT during the review, Norway indicated that the recalculation was made because the Party was unable to find the original source of the country-specific EF or any documentation explaining how it was derived. The ERT noted that the activity occurs in the country as the Party reported emissions from poultry manure management.

65. Having previously identified poultry enteric fermentation emissions as a country-specific category, the ERT concluded that Norway did not sufficiently justify the use of the notation key "NO" in the recalculation. The ERT noted that Norway included emissions from this category in the inventory used for the calculation of the assigned amount. The ERT further noted that removing emissions from this category will lead to incompleteness[10] of CH_4 emissions from enteric fermentation and therefore included this issue in the list of potential problems and further questions raised by the ERT.

66. In response to the list of potential problems and further questions raised by the ERT, the Party submitted revised estimates of CH_4 emissions from enteric fermentation of poultry for the entire time series, which were estimated based on the country-specific EF

[9] Kirchgessner M, Windisch W. and Muller HL. 1995. Nutritional factors for the quantification of methane production. *In:* Engelhardt Wv, Leonhard-Marek S, Breves G and Giesecke D (eds.). *Ruminant Physiology: Digestion, Metabolism, Growth and Reproduction.* Proceedings of the Eighth International Symposium on Ruminant Physiology. Stuttgart: Ferdinand Enke Verlag.

[10] The UNFCCC reporting guidelines, paragraph 4, define completeness as follows: "*Completeness* means that an inventory covers all sources and sinks, as well as all gases, included in the IPCC Guidelines as well as other existing relevant source/sink categories which are specific to individual Annex I Parties and, therefore, may not be included in the IPCC Guidelines."

used in the previous annual submission. The ERT accepted the revised estimates. The change in the estimates increased CH_4 emissions from enteric fermentation in 2012 by 1.92 Gg CO_2 eq, or less than 0.1 per cent. The ERT recommends that Norway review the enteric fermentation EF for poultry, ensuring that the country-specific EF is appropriately documented in accordance with the IPCC good practice guidance.

Agricultural soils – N_2O

67. Norway applies a country-specific model to estimate the amount of N volatilized from synthetic fertilizers. The model uses data on the N applied by fertilizer type and fertilizer-specific volatilization rates ($Frac_{GASF}$) (i.e. 15 per cent for urea, 5 per cent for ammonium nitrate and sulphate and 1 per cent or less for other types of synthetic fertilizer). The average $Frac_{GASF}$ reported by Norway (0.009–0.017) (CRF table 4.D) is among the lowest values of all reporting Parties. In response to a question raised by the ERT during the review, Norway explained that this low average value results from the low consumption of urea and other fertilizers with a higher $Frac_{GASF}$ and the Party also provided the calculation of average $Frac_{GASF}$ to the ERT. Although the transparency of the inventory has improved since the previous annual submission, in particular by the inclusion in the NIR of a table presenting the amounts of different fertilizers used, their N content and the $Frac_{GASF}$ applied, the ERT recommends that Norway further improve transparency by including in the NIR the information provided to the ERT during the review.

3. Non-key categories

Manure management – CH_4

68. The ERT commends Norway for having implemented new data and methods for estimating the CH_4 emissions from manure management. The improvements implemented include: the use of livestock population numbers that are consistent with those used to estimate the other emission categories; the allocation of waste to specific manure management systems; and the use of appropriate methane conversion factors (MCFs). In addition, for cattle, pigs and poultry new country-specific methods for estimating volatile solids (VS) have been implemented, which generate estimates that are comparable with those of other reporting Parties.

69. Although Norway uses a tier 2 method and an enhanced livestock characterization to estimate enteric fermentation emissions from sheep, the tier 1 IPCC default method is applied to estimate CH_4 emissions from manure management. The IPCC good practice guidance (page 4.8) states than an "enhanced" characterization should be used to estimate emissions across all the relevant sources if a tier 2 method is used for either enteric fermentation or manure management. The ERT noted that it should be possible for Norway to apply the IPCC tier 2 methods, as country-specific data on intake levels, manure management system allocations and MCFs are available. The ERT also notes that the IPCC default method will not provide accurate estimates where the assumed waste allocation, MCFs and VS production differ significantly from those occurring in the country, as appears to be the case for Norway. Although CH_4 emissions from manure management of sheep are small in Norway (6.03 Gg CO_2 eq in 2012), the ERT recommends that Norway explore the possibility of applying a tier 2 method to estimate the manure management CH_4 emissions from sheep.

E. Land use, land-use change and forestry

1. Sector overview

70. In 2012, net removals from the LULUCF sector amounted to 26,677.67 Gg CO_2 eq. Since 1990, net removals have increased by 162.9 per cent. The key driver for the rise in

net removals is the steadily increasing growth in living biomass in forest land remaining forest land resulting from the forest management policy over the past 60–70 years, which includes the intensive planting of trees in new areas and replanting of trees after harvesting on existing forest land. Within the sector, 30,740.54 Gg CO_2 eq of net removals were from forest land, followed by 51.46 Gg CO_2 eq from wetlands. Net emissions were reported from settlements (1,991.19 Gg CO_2 eq) and from cropland (1,799.55 Gg CO_2 eq). Net emissions from grassland accounted for 305.83 Gg CO_2 eq and other (LULUCF) accounted for 15.21 Gg CO_2 eq. The remaining 2.54 Gg CO_2 eq of net emissions were from other land.

71. Norway has made recalculations between the 2013 and 2014 annual submissions for this sector. The two most significant recalculations made by Norway between the 2013 and 2014 annual submissions were in the following categories: forest land and settlements. The recalculations were made in particular in response to the 2013 annual review report and following changes in AD (see para. 72 below). Compared with the 2013 annual submission, the recalculations increased removals in the LULUCF sector by 39.03 Gg CO_2 eq (0.1 per cent). The recalculations were adequately explained in section 7.13 of the NIR.

72. The ERT noted the new method applied by Norway for estimating annual values for living biomass on all land-use classes based on: (1) interpolation/extrapolation to derive mid-year instead of end-of-year area estimates; and (2) a revised factor from harvest statistics to estimate carbon stock changes, as well as improvements to the Yasso07 model to estimate soil carbon stock changes in forest land remaining forest land. The ERT welcomes these improvements.

73. The ERT noted the efforts from Norway, in response to the recommendations made in previous review reports, to identify the areas of "other land" that have the potential to become forests. The ERT welcomes the inclusion of table 7.28 in Norway's 2014 NIR presenting the area of "other land" divided into bare land, coastal heath land and other wooded land, both above and below alpine forest limits, and the clarification that about 7 per cent of other land has the potential to become forest.

74. The ERT found that in its 2014 annual submission Norway used the notation key "NO" in cases where emissions were considered negligible (e.g. controlled burning in forest land). The ERT found that this is not in line with the UNFCCC reporting guidelines, paragraph 28, according to which, "The notation keys are used as follows: (a) 'NO' (not occurring) for activities or processes in a particular source or sink category that do not occur within a country; (b) 'NE' for existing emissions by sources and removals by sinks of greenhouse gases which have not been estimated. Where 'NE' is used in an inventory for emissions or removals of CO_2, N_2O, CH_4, HFCs, PFCs or SF_6, the Annex I Party should indicate in both the NIR and the CRF completeness table why emissions or removals have not been estimated; (c) 'NA', for activities in a given source/sink category that do not result in emissions or removals of a specific gas". It is further specified in footnote 8 that "Even if emissions are considered negligible, Parties should either report the emission estimate if calculated or use the notation key 'NE'". In response to a question raised by the ERT during the review, Norway explained that its 2014 NIR (page 298) states how notation keys were used in the annual submission (in relation to the LULUCF sector): "The use of notation keys has been consistently applied throughout this report in the following manner: 'NE' for a sink/source that could not be estimated due to a lack of methods, activity data or when not mandatory according to the guidelines; 'NO' for a sink/source with emissions approximately zero or when estimated emissions, areas, or quantities (e.g. lime or fertilizer) were actually zero; 'NA' for sink/sources that do not exist and when methods do not apply". The ERT recommends that Norway use notation keys consistent with the UNFCCC reporting guidelines to improve the comparability and transparency of its inventory.

2. Key categories

Forest land remaining forest land – CO_2

75. Norway's 2014 NIR (page 317) states that "The uncertainty of the area of drained forest soils is assumed to be zero, as it is based on subsidy applications". In response to a question raised by the ERT during the review, Norway recognized that it is unlikely that 100 per cent of the drainage that takes place is subsidized, and that the real figure is probably closer to 95 per cent, as subsidies only cover maintenance of old ditches (establishment of new drainage ditches was prohibited by law in 2007). Norway later noted that after further investigation into the issue, an uncertainty of 50 per cent for the area of drained organic soils on forest land will be implemented in the 2015 annual submission. The uncertainty estimate of 50 per cent includes potential errors in the stratification of the area according to the nutrient rich and nutrient poor EFs. The ERT welcomed the planned improvement.

F. Waste

1. Sector overview

76. In 2012, emissions from the waste sector amounted to 1,194.32 Gg CO_2 eq, or 2.3 per cent of total GHG emissions. Since 1990, emissions have decreased by 35.9 per cent. The key driver for the fall in emissions is in the category solid waste disposal on land – a reduction of the amount of degradable waste disposed at solid waste disposal sites (SWDS) as a result of the policies and measures introduced in the waste sector in the 1990s and legislation banning the deposition of biodegradable waste to landfills in 2009. Within the sector, 86.6 per cent of the emissions were from solid waste disposal on land, followed by 12.7 per cent from wastewater handling, 0.7 per cent from other (waste) and less than 0.1 per cent from waste incineration.

77. The Party has made recalculations between the 2013 and 2014 annual submissions for this sector. The most significant recalculation made by Norway between the 2013 and 2014 annual submissions was in the following category: other (waste). The recalculation was made to improve completeness by estimating, for the first time, N_2O emissions from sewage sludge applied on parks and green spaces, cover on landfills, and other uses in non-agricultural soils. Compared with the 2013 annual submission, the recalculations increased emissions in the waste sector by 7.93 Gg CO_2 eq (0.6 per cent) and had a negligible impact on total national emissions. The recalculations were adequately explained.

78. The previous review report included a strong recommendation that Norway include in the inventory all the emissions from the combustion of CH_4 recovered in the wastewater treatment plants, which is used in the pulp and paper industry for energy production. The ERT noted that in the NIR (page 373) Norway explained that the combustion-related emissions from energy recovery of CH_4 in the pulp and paper industry are included in the inventory for 2009–2012 in the subcategory pulp, paper and print in the energy sector, and that emissions for the entire time series will be included in the next annual submission. The ERT recommends that Norway implement the planned improvement to improve time-series consistency.

2. Key categories

Solid waste disposal on land – CH_4

79. Norway used a country-specific first-order decay (FOD) method which is in effect the same as that described in the 2006 IPCC Guidelines to estimate CH_4 emissions from solid waste disposal on land. Norway has also provided detail of the methodology to

calculate dissimilating degradable organic carbon (DOC) and CH_4 emissions from SWDS in its NIR (pages 367–369). The ERT considers that the use of this country-specific FOD method is in line with the IPCC good practice guidance.

80. The ERT considers that there is a lack of transparency regarding the trend in CH_4 emissions from solid waste disposal on land presented in figure 8.1 in the NIR (page 367). The ERT noted that Norway has reported the amount of waste deposited in SWDS categorized by types of waste in its NIR (table 8.2, page 370) only for the year 2012. In response to a question raised by the ERT during the review, Norway provided information on the amount of waste deposited in SWDS categorized by types of waste during the period 1945–2012, which can justify the changes in DOC content in waste deposited and the corresponding CH_4 emissions. The ERT recommends that Norway include this information in its NIR to improve the transparency of its reporting.

Wastewater handling – N_2O

81. Following an observation included in the previous review report, Norway has revised the protein consumption values reported in CRF table 6.B from "NA" to the values reported in table 8.6 in the NIR of the 2014 annual submission. The ERT commends Norway for this revision.

3. Non-key categories

Waste incineration – CO_2

82. Norway has reported in the NIR (page 380) that its reporting of emissions from waste incineration includes emissions from flaring (except flaring reported in the energy and industrial processes sectors), and emissions from cremation and hospital waste until 2005. The ERT noted that Norway did not transparently provide information on AD for waste incineration in its NIR. In response to a question raised by the ERT during the review, Norway provided information on the amount of hospital waste incinerated during the period 1990–2012 (zero for 2006–2012) which can justify the reported CO_2 emissions from waste incineration. The ERT recommends that Norway include this information in its NIR to improve the transparency of its reporting.

G. Supplementary information required under Article 7, paragraph 1, of the Kyoto Protocol

1. Information on activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol

Overview

83. Table 6 provides an overview of the information reported and parameters selected by Norway under Article 3, paragraphs 3 and 4, of the Kyoto Protocol.

Table 6
Supplementary information reported under Article 3, paragraphs 3 and 4, of the Kyoto Protocol

Issue	*Expert review team assessment, if applicable*	*Findings and recommendations*
Assessment of the Party's reporting in accordance with the requirements in paragraphs 5–9 of the annex to decision 15/CMP.1	Sufficient	

Issue	*Expert review team assessment, if applicable*	*Findings and recommendations*
Activities elected under Article 3, paragraph 4, of the Kyoto Protocol	Activities elected: forest management Years reported: 2008, 2009, 2010, 2011, 2012	
Period of accounting	Commitment period accounting	
Party's ability to identify areas of land and areas of land-use change in accordance with paragraph 20 of the annex to decision 16/CMP.1	Sufficient	

84. Section G.1 includes the ERT's assessment of the 2014 annual submission against the Article 8 review guidelines and decisions 15/CMP.1 and 16/CMP.1. In accordance with decision 6/CMP.9, Parties will begin reporting of KP-LULUCF activities in the submissions due by 15 April 2015 using revised CRF tables, as contained in the annex to decision 6/CMP.9. Owing to this change in the CRF tables for KP-LULUCF activities, and the change from the first commitment period to the second commitment period, paragraphs 85–90 below contain the ERT's assessment of the Party's adherence to the current guidelines for reporting and do not provide specific recommendations for reporting of these activities for the 2015 annual submission.

Activities under Article 3, paragraph 3, of the Kyoto Protocol

Afforestation and reforestation – CO_2

85. Previous review reports made the recommendation that Norway continue to develop a methodology for estimating and reporting all carbon pools, including soil organic carbon, in order to fulfil the requirements under decisions 15/CMP.1 and 16/CMP.1. The ERT noted that in its 2014 annual submission (NIR, table 10.6), Norway states that organic soils occurred only in units of land not harvested and reports carbon stock changes in all the pools in such lands since the beginning of the commitment period, including reporting for the first time losses in above-ground and below-ground biomass (which were reported as "NO" in the previous annual submission).

Deforestation – CO_2

86. The previous review report included a recommendation that Norway include estimates for carbon stock changes from organic soils in its annual submission. The ERT noted that in its 2014 annual submission Norway included estimates for all carbon pools in areas under deforestation activities, including carbon stock changes in organic soils (which were reported as "NE" in the previous annual submission). The ERT welcomes this effort from Norway.

87. In KP-LULUCF CRF table NIR-1, Norway reports CO_2 emissions from biomass burning in deforestation as "IE, NO", whereas in KP-LULUCF CRF table 5(KP-II)5 only the notation key "NO" is used under deforestation. In response to a question raised during the previous stages of the review, Norway recognized that there is an error in the KP-LULUCF CRF table NIR-1, where "NO" should be reported instead of "IE, NO".

Activities under Article 3, paragraph 4, of the Kyoto Protocol

Forest management – CO_2

88. In KP-LULUCF CRF table NIR-1, Norway reports CO_2 emissions from liming in forest management as "R" (reported), whereas in KP-LULUCF CRF table 5(KP-II)4 the notation key "NA" is used for forest management. In response to a question raised during the previous stages of the review, Norway stated that the correct notation key is "NO", as there is no application of lime in Norwegian forests.

89. In response to a question raised by ERT during the review regarding the consistency of areas between land-use categories under the Convention and KP-LULUCF activities, Norway stated that: "In the NIR 2014 Norway reported a small area of forest land that had been converted to wetlands due to a natural river overflowing under other in the KP. The area should have remained in forest management. However, this is a small area of less than 1 kha with zero emissions for living biomass. Thus, this will not have an impact on the KP accounting quota. Norway will correct this mistake in the 2015 NIR reporting". The ERT noted that, by definition, land under forest management areas should contain living biomass, and if the area is converted to another land use it is assumed that some of the biomass is lost. The ERT concluded that the response from Norway was not sufficiently transparent to conclude that no underestimation of emissions or overestimation of removals occurred and therefore included the issue in the list of potential problems and further questions raised by the ERT.

90. In the list of potential problems and further questions raised by the ERT, the ERT requested Norway to: (1) provide clarification regarding how the flooded area was considered under forest management; and (2) provide justification that no CO_2 emissions from living biomass and other carbon pools occurred and that no CH_4 and N_2O emissions occurred in the flooded area. Regarding point (1), Norway clarified that when the plot was visited in 1996, it contained regeneration (trees smaller than 5 cm in diameter at breast height (dbh)) because of a harvest before 1988. The regeneration was denser but still not tall enough to result in measurements of significant dbh at the second visit to the plot in 1996. Between 1996 and 2001 a beaver most likely built a dam, which resulted in a rise of the water table and thus this was a non-anthropogenic change from forest to wetlands. In 2006, the plot was not visited but aerial photographs showed some flooding remained and it was judged as a wetland. However, five years later, in 2011, the dam had been completely destroyed and the plot was drained. Mostly bare rock was visible. As this was not human-induced deforestation, the Party considers it correct to report the land as forest management during the commitment period, as land can only leave the forest management category if it is transferred to deforestation. Regarding point (2), the ERT noted that there are no methods in the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry* to estimate emissions during flooding (relevant for years 2008–2010). Furthermore, Norway explained that after the temporary flooding, when the area returned to a drained condition, both CO_2 and N_2O emissions occurred and these were reported under forest management. The Party stated that the reason these emissions were reported under forest management for this particular plot is that it is classified as having drained organic soils. The AD of drained organic forest soils are derived from Statistics Norway and are not spatially explicit. The Party also stated that emissions from all drained organic forest soils in Norway have been appropriately reported under forest management or afforestation/reforestation. The ERT considered that the explanations provided by Norway on these two issues resolved the potential problem.

2. Information on Kyoto Protocol units

Standard electronic format and reports from the national registry

91. Norway has reported information on its accounting of Kyoto Protocol units in the required SEF tables, as required by decisions 15/CMP.1 and 14/CMP.1. The ERT took note of the findings and recommendations included in the standard independent assessment report (SIAR) on the SEF tables and the SEF comparison report.[11] The SIAR was forwarded to the ERT prior to the review, pursuant to decision 16/CP.10. The ERT reiterated the main findings and recommendations contained in the SIAR.

92. Information on the accounting of Kyoto Protocol units has been prepared and reported in accordance with decision 15/CMP.1, annex, chapter I.E, and reported in accordance with decision 14/CMP.1 using the SEF tables. This information is consistent with that contained in the national registry and with the records of the international transaction log (ITL) and the clean development mechanism registry and meets the requirements referred to in decision 22/CMP.1, annex, paragraph 88(a–j). The transactions of Kyoto Protocol units initiated by the national registry are in accordance with the requirements of the annex to decision 5/CMP.1 and the annex to decision 13/CMP.1. No discrepancy has been identified by the ITL and no non-replacement has occurred. The national registry has adequate procedures in place to minimize discrepancies.

93. The ERT noted from the SIAR that Norway's national registry has not fulfilled the requirements regarding the public availability of information in accordance with section II.E of the annex to decision 13/CMP.1. In particular, the Party's publicly available information did not contain data for 2013 at the time of the standard independent assessment. The ERT reiterates the recommendation made in the SIAR that the Party include up-to-date holding and transaction information as required by decision 13/CMP.1, annex, paragraph 47(b), (e) and (j).

Accounting of activities under Article 3, paragraph 3, of the Kyoto Protocol and any elected activities under Article 3, paragraph 4, of the Kyoto Protocol

94. Norway has reported information on its accounting of KP-LULUCF in the accounting table, as included in the annex to decision 6/CMP.3. Information on the accounting of KP-LULUCF has been prepared and reported in accordance with decisions 16/CMP.1 and 6/CMP.3.

95. Norway submitted revised KP-LULUCF CRF tables on 29 January 2015 in order to revise the accounting table which in the original submission did not account for the Article 3, paragraph 3, offset in the accounting of GHG emissions by sources and removals by sinks in areas under forest management under Article 3, paragraph 4. Table 7 shows the accounting quantities for KP-LULUCF as reported by the Party and the final values after the review.

[11] The SEF comparison report is prepared by the international transaction log (ITL) administrator and provides information on the outcome of the comparison of data contained in the Party's SEF tables with corresponding records contained in the ITL.

Table 7
Accounting quantities for activities under Article 3, paragraph 3, and, if any, activities under Article 3, paragraph 4, of the Kyoto Protocol, in t CO_2 eq

	2014 annual submission[a]		
	As reported	*Revised estimates*	*Final accounting quantity*[b]
Afforestation and reforestation			
Non-harvested land	–2 614 190		–2 614 190
Harvested land	0		0
Deforestation	11 771 985		11 771 985
Forest management	–7 333 333	–16 491 128	–16 491 128
Article 3.3 offset[c]	0	–9 157 795	–9 157 795
Forest management cap[d]	–7 333 333		–7 333 333
Cropland management	NA		NA
Grazing land management	NA		NA
Revegetation	NA		NA

Abbreviations: CRF = common reporting format, KP-LULUCF = land use, land-use change and forestry emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, NA = not applicable.

[a] The values included under the 2014 annual submission are the cumulative accounting values for 2008, 2009, 2010, 2011 and 2012, as reported in the accounting table of the KP-LULUCF CRF tables for the inventory year 2012.

[b] The "final accounting quantity" is the quantity of Kyoto Protocol units that the Party shall issue or cancel under each activity under Article 3, paragraph 3, and paragraph 4, if relevant, based on the final accounting quantity in the 2014 annual submission.

[c] "Article 3.3 offset": for the first commitment period, a Party included in Annex I to the Convention that incurs a net source of emissions under the provisions of Article 3, paragraph 3, of the Kyoto Protocol may account for anthropogenic greenhouse gas emissions by sources and removals by sinks in areas under forest management under Article 3, paragraph 4, up to a level that is equal to the net source of emissions under the provisions of Article 3, paragraph 3, but not greater than 9.0 megatonnes of carbon times five, if the total anthropogenic greenhouse gas emissions by sources and removals by sinks in the managed forest since 1990 is equal to, or larger than, the net source of emissions incurred under Article 3, paragraph 3.

[d] In accordance with decision 16/CMP.1, annex, paragraph 11, for the first commitment period only, additions to and subtractions from the assigned amount of a Party resulting from forest management under Article 3, paragraph 4, of the Kyoto Protocol after the application of decision 16/CMP.1, annex, paragraph 10, and resulting from forest management project activities undertaken under Article 6, shall not exceed the value inscribed in the appendix of the annex to decision 16/CMP.1, times five.

96. Based on the information provided in table 7 for the activity afforestation and reforestation, Norway shall: for non-harvested land, issue 2,614,190 removal units (RMUs) in its national registry; and for harvested land, neither issue nor cancel any units in its national registry.

97. Based on the information provided in table 7 for the activity deforestation, Norway shall cancel 11,771,985 assigned amount units (AAUs), emission reduction units (ERUs) and/or certified emission reduction units (CERs) and/or RMUs in its national registry.

98. Based on the information provided in table 7 for the activity forest management, Norway shall issue 16,491,128 RMUs in its national registry.

Calculation of the commitment period reserve

99. Norway has reported its commitment period reserve in its 2014 annual submission. Norway reported that its commitment period reserve has not changed since the initial report review (225,519,117 t CO_2 eq) as it is based on the assigned amount and not the most recently reviewed inventory. The ERT agrees with this figure.

3. Changes to the national system

100. Norway reported in the NIR (chapter 13) that there are changes in its national system since the previous annual submission. The Party described the changes as: (1) the QA/QC report for the Norwegian Forest and Landscape Institute has been revised and there has been a revision of the description of the general annual QC procedures in annex V of the NIR to better reflect the QC checks performed; (2) a new formalized agreement was made in 2013 between the Norwegian Environment Agency and Statistics Norway, which includes details about the cooperation in preparing the national emissions inventory. During the review, Norway explained that the former Climate and Pollution Agency, which had overall responsibility for the national inventory, and the Norwegian Directorate for Nature Management have been merged to form the Norwegian Environment Agency. The ERT noted that this change in the national system was not reported in chapter 13 of the NIR, in section 1.2 on institutional arrangements for inventory preparation or in annex V to the NIR "National Greenhouse Gas Inventory System in Norway". However, the merger was reflected in, for example, footnotes 4 (page 75) and 6 (page 187) of the NIR, which refer to former Climate and Pollution Agency. The ERT also noted that annex V to the NIR was partly updated to reflect the change. The ERT concluded that, taking into account the confirmed changes in the national system, the Party's national system continues to be in accordance with the requirements of national systems outlined in decision 19/CMP.1. The ERT recommends that the Party report in its annual submission any change(s) in its national system in accordance with decision 15/CMP.1, annex, chapter I.F and/or further relevant decisions of the Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol (CMP). The ERT further recommends that Norway improve QC procedures to ensure that all information reported in the NIR is up-to-date.

4. Changes to the national registry

101. Norway reported in its NIR that there are changes in its national registry since the previous annual submission, as follows:

(a) Change to database structure or the capacity of national registry: an updated diagram of the database structure is available; iteration 5 of the national registry released in January 2013 and iteration 6 of the national registry released in June 2013 introduce changes in the structure of the database;

(b) Change regarding conformance to technical standards: changes introduced in releases 5 and 6 of the national registry were limited and only affected EU ETS functionality;

(c) Change regarding test results: changes introduced in releases 5 and 6 of the national registry were limited and only affected EU ETS functionality. Both regression testing and tests on the new functionality were successfully carried out prior to release of the version to production. The site acceptance test was carried out by QA consultants on behalf of and assisted by the European Commission.

102. The ERT noted from the SIAR that in its description of changes to the national registry in the NIR, Norway refers to annex A (updated diagram of the database structure) and annex B (test results), but these annexes are not provided as part of the annual submission. The ERT recommends that Norway include annexes A and B as part of its

annual submission and that the Party improve QC procedures to ensure that the annual submission includes all relevant annexes.

103. The ERT concluded that, taking into account the confirmed changes in the national registry, the Party's national registry continues to fully perform the functions set out in the annex to decision 13/CMP.1 and the annex to decision 5/CMP.1 and continues to adhere to the technical standards for data exchange between registry systems in accordance with relevant decisions of the CMP.

5. Minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol

104. Consistent with paragraph 23 of the annex to decision 15/CMP.1, Norway provided information relating to how it is striving, under Article 3, paragraph 14, of the Kyoto Protocol, to implement its commitments in such a way as to minimize adverse social, environmental and economic impacts on developing country Parties, particularly those identified in Article 4, paragraphs 8 and 9, of the Convention. Norway presented a summary of information in the NIR on international energy and climate initiatives, including information on cooperation with developing countries regarding "Clean Energy for Development" and "Oil for Development" initiatives and carbon dioxide capture and storage.

105. Norway reported that there are changes in its reporting of the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol since the previous annual submission. The Party described the specific changes on the initiatives and programmes mentioned in paragraph 104 above. The ERT concluded that, taking into account the confirmed changes in the reporting, the information provided is complete and transparent.

III. Conclusions and recommendations

A. Conclusions

106. Table 8 summarizes the ERT's conclusions on the 2014 annual submission of Norway, in accordance with the Article 8 review guidelines.

Table 8
Expert review team's conclusions on the 2014 annual submission of Norway

Issue	*Expert review team assessment*	*Paragraph cross-references for identified problems*
The ERT concludes that the inventory submission of Norway is complete with regard to categories, gases, years and geographical boundaries and contains both an NIR and CRF tables for 1990–2012		
Annex A sources[a]	Complete	
LULUCF[a]	Complete	
KP-LULUCF	Complete	
The ERT concludes that the inventory submission of Norway has been prepared and reported in accordance with the UNFCCC reporting guidelines	Generally	See paras. 28–30, 43–44 and 74 above

Issue	*Expert review team assessment*	*Paragraph cross-references for identified problems*
The Party's inventory is in accordance with the Revised 1996 IPCC Guidelines, the IPCC good practice guidance and the IPCC good practice guidance for LULUCF	Yes	
The submission of information required under Article 7, paragraph 1, of the Kyoto Protocol has been prepared and reported in accordance with decision 15/CMP.1	Yes	See para. 100 above
Party has reported information on its accounting of Kyoto Protocol units in accordance with decision 15/CMP.1, annex, chapter I.E, and used the required reporting format tables as specified by decision 14/CMP.1	Yes	See para. 93 above
The national system continues to perform its required functions as set out in the annex to decision 19/CMP.1	Yes	
The national registry continues to perform the functions set out in the annex to decision 13/CMP.1 and the annex to decision 5/CMP.1 and continues to adhere to the technical standards for data exchange between registry systems in accordance with relevant CMP decisions	Yes	See para. 102 above
Did the Party provide information in the NIR on changes in its reporting of the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol?	Yes	

Abbreviations: Annex A sources = source categories included in Annex A to the Kyoto Protocol, CMP = Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol, CRF = common reporting format, ERT = expert review team, IPCC = Intergovernmental Panel on Climate Change, IPCC good practice guidance = IPCC *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories*, IPCC good practice guidance for LULUCF = IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry*, KP-LULUCF = LULUCF emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, LULUCF = land use, land-use change and forestry, NIR = national inventory report, Revised 1996 IPCC Guidelines = *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*, UNFCCC reporting guidelines = "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories".

[a] The assessment of completeness by the ERT considers only the completeness of reporting of mandatory categories (i.e. categories for which methods and default emission factors are provided in the Revised 1996 IPCC Guidelines, the IPCC good practice guidance or the IPCC good practice guidance for LULUCF).

B. Recommendations

107. The ERT identified the issues for improvement listed in table 9. All recommendations are for the next annual submission, unless otherwise specified. The ERT notes that this review report of the 2014 annual submission will be published after 15 April 2015. Where recommendations cannot be fully implemented in time for the 2015 annual submission, the ERT recommends that the Party provide an update on progress of implementation in the NIR.

Table 9
Recommendations identified by the expert review team

Sector	*Category/cross-cutting issue*	*Recommendation*	*Reiteration of previous recommendation? (Yes or No)*	*Paragraph cross-references*
Cross-cutting	QA/QC	Ensure that sufficient time and resources are made available for QC activities	No	12
		Review the QA/QC procedures in place	No	12
		Consider if a QC manager overseeing QC activities for the compilation and reporting of the whole inventory would be beneficial	No	12
	Inventory preparation	Provide documentation on the country-specific uncertainty values for AD and a justification why the differences in reference and sectoral approaches are not reflected in the uncertainty estimates	No	Table 4
		Update the trend uncertainty analysis annually and report on it in the NIR	No	Table 4
	Inventory management	Develop the documentation project and ensure that all necessary information on country-specific methods, disaggregated EFs, parameters and AD is fully documented	Yes	16
Energy	General	Report the CH_4 and N_2O EFs in energy units in the NIR to improve transparency	Yes	21
	Comparison of the reference approach with the sectoral approach and international statistics	Continue the work to analyse the reasons for the differences between the reference and sectoral approaches and between the inventory and the IEA statistics	No	26
		Continue to improve the accuracy of the data collection procedures for liquid and gaseous fuels in order to further reduce the level of difference between the sectoral and reference approaches	Yes	26
		Improve the data collection procedures for solid fuels (coal and coke oven coke) in order to reduce the statistical differences in the energy balance	No	26
	Feedstocks and non-energy use of fuels	Document in the NIR the approach used to provide revised estimates and report in CRF table 1.A(d) where the emissions are included in order to ensure transparency	No	29

Sector	*Category/cross-cutting issue*	*Recommendation*	*Reiteration of previous recommendation? (Yes or No)*	*Paragraph cross-references*
		Improve QC procedures to ensure consistency of the information reported in different CRF tables	No	29, 30
		Review and revise the reporting in CRF table 1.A(d)	No	30
		Provide in the NIR, for fuels for which fraction of carbon stored is smaller than 1.00, balances showing that all non-energy use of fuels is accounted for under the industrial processes sector	Yes	30
	Stationary combustion: gaseous and solid fuels – CO_2	Include in the NIR the information provided to the ERT during the review on CO_2 IEF for gaseous fuels used in public electricity and heat production	No	31
		Include in the NIR the information provided to the ERT during the review on CO_2 IEF for solid fuels used in public electricity and heat production	No	32
		Include in the NIR the information provided to the ERT during the review on CO_2 IEF for solid fuels in the subcategory chemicals	No	33
	Road transportation: liquid and gaseous fuels – CH_4 and N_2O	Carry out the assessment of data quality	No	34
		Scale the bottom-up estimates to match fuel sales, if appropriate	Yes	34
	Oil and natural gas: liquid and gaseous fuels – CO_2 and CH_4	Carry out the planned review of notation keys	No	35
Industrial processes and solvent and other product use	Ammonia production – CO_2	Carry out the planned recalculation	No	39
		Provide information on the mix of gases in the NIR	No	39
		Further investigate, to the extent possible, the reasons for the inter-annual changes in CO_2 IEF	No	39

Sector	*Category/cross-cutting issue*	*Recommendation*	*Reiteration of previous recommendation? (Yes or No)*	*Paragraph cross-references*
	Aluminium production – CO_2	Justify the change in the CO_2 IEF in the NIR	No	40
	Consumption of halocarbons and SF_6 – HFCs and PFCs	Estimate PFC emissions from refrigeration for 2009–2012 or justify that "NO" is the appropriate notation key for actual emissions of PFCs	No	41
		Investigate whether the reported amount of HFC-134 is a misclassification or a real use and correct the information and the data accordingly	No	42
		Justify that "NO" is the appropriate notation key for HFC-134 or estimate HFC-134 emissions from filling for 2008 and onwards	Yes	42
		Provide more transparent information for each category (foam blowing, fire extinguishers, aerosols/MDI and solvents) to demonstrate the accuracy of the reported emissions in the NIR (for instance, by explaining the use of F-gas species by category and the level of emissions per capita and trends compared with other reporting Parties with similar national circumstances)	No	45
	Limestone and dolomite use – CO_2	Elaborate a mass balance of the limestone and dolomite used in the country, including imports, exports and details of the various uses to justify that all potential uses of carbonates are taken into account and the corresponding CO_2 emissions are reported	No	48
		Provide in the NIR the information supporting the decrease of CO_2 IEF	No	49
	Soda ash production and use – CO_2	Explain in the NIR the methodology and data sources used to prepare revised estimates	No	55
		Improve the QC procedures to rectify errors in AD and emission factors	No	55
	Other (mineral products) – CO_2	Correct the error in the NIR and improve the QC procedures for the inventory to avoid such errors	No	56
Agriculture	General	Provide additional information in the NIR on the method used to estimate the number of heifers for replacement	No	59

Sector	*Category/cross-cutting issue*	*Recommendation*	*Reiteration of previous recommendation? (Yes or No)*	*Paragraph cross-references*
		Include in table 6.5 of the NIR the key calculation parameters for cattle less than one year old	No	59
		Improve the description of the N flow model, perhaps by including a diagram of the flows, in the NIR	Yes	60
		Improve QC of the CRF tables and NIR	Yes	61
		Correct the animal waste allocations in CRF table 4.B(a)	No	61
		Report the average N excretion in CRF table 4.B(b) and climate allocation in CRF table 4.B.(a) for "other livestock"	No	61
		Correct the NH_3 EFs for "other livestock" in NIR table 6.14	No	61
	Enteric fermentation – CH_4	Review the enteric fermentation EF for poultry, ensuring that the country-specific EF is appropriately documented in accordance with the IPCC good practice guidance	No	66
	Agricultural soils – N_2O	Provide in the NIR the information provided to the ERT during the review	No	67
	Manure management – CH_4	Explore the possibility of applying a tier 2 method to estimate the manure management CH_4 emissions from sheep	No	69
LULUCF	General	Use the notation keys consistent with the UNFCCC reporting guidelines	No	74
Waste	General	Implement the planned improvement regarding combustion-related emissions from energy recovery of CH_4 in the pulp and paper industry	No	78
	Solid waste disposal on land – CH_4	Include in the NIR the information on the amount of waste deposited in SWDS categorized by types of waste during the period 1945–2012	No	80
		Include in the NIR the information on the amount of hospital waste incinerated during the period 1990–2012	No	82
National system		Report any change(s) in the national system	No	100
		Improve QC procedures to ensure that all information reported in the NIR is up-to-date	No	100

Sector	*Category/cross-cutting issue*	*Recommendation*	*Reiteration of previous recommendation? (Yes or No)*	*Paragraph cross-references*
National registry		Include up-to-date holding and transaction information as part of the publicly available information	No	93
		Include annexes A and B as part of the annual submission	No	102
		Improve QC procedures to ensure that the annual submission includes all relevant annexes	No	102

Abbreviations: AD = activity data, CRF = common reporting format, EF = emission factor, ERT = expert review team, F-gas = fluorinated gas, IEA = International Energy Agency, IEF = implied emission factor, LULUCF = land use, land-use change and forestry, MDI = metered dose inhaler, N = nitrogen, NIR = national inventory report, NO = not occurring, QA = quality assurance, QC = quality control, SWDS = solid waste disposal site.

IV. Questions of implementation

108. No questions of implementation were identified by the ERT during the review.

Annex I

Information to be included in the compilation and accounting database

Table 10
Information to be included in the compilation and accounting database in t CO_2 eq for 2012, including the commitment period reserve

	As reported	*Revised estimates*	*Adjustment*[a]	*Final*[b]
Commitment period reserve	225 519 117			225 519 117
Annex A emissions for 2012				
CO_2	44 101 233	44 123 193		44 123 193
CH_4	4 226 901	4 228 882		4 228 882
N_2O	3 200 056	3 200 112		3 200 112
HFCs	972 336			972 336
PFCs	172 389			172 389
SF_6	60 327			60 327
Total Annex A sources[c]	**52 733 243**	**52 757 239**		**52 757 239**
Activities under Article 3, paragraph 3, for 2012				
3.3 Afforestation and reforestation on non-harvested land for 2012	–560 824			–560 824
3.3 Afforestation and reforestation on harvested land for 2012	–10 614			–10 614
3.3 Deforestation for 2012	2 583 813			2 583 813
Activities under Article 3, paragraph 4, for 2012[d]				
3.4 Forest management for 2012	–30 187 295			–30 187 295
3.4 Cropland management for 2012				
3.4 Cropland management for the base year				
3.4 Grazing land management for 2012				
3.4 Grazing land management for the base year				
3.4 Revegetation for 2012				
3.4 Revegetation for the base year				

Abbreviation: Annex A sources = source categories included in Annex A to the Kyoto Protocol.

[a] "Adjustment" is relevant only for Parties for which the expert review team has calculated one or more adjustment(s).

[b] "Final" includes revised estimates, if any, and/or adjustments, if any.

[c] The values for "Total Annex A sources" in the columns "As reported", "Revised estimates" and "Final" may not equal the sum of the values for the gases in those columns owing to rounding.

[d] Activities under Article 3, paragraph 4, are relevant only for Parties that elected one or more such activities.

Table 11
Information to be included in the compilation and accounting database in t CO_2 eq for 2011

	As reported	*Revised estimates*	*Adjustment*[a]	*Final*[b]
Annex A emissions for 2011				
CO_2	44 571 687	44 596 361		44 596 361
CH_4	4 283 040	4 284 942		4 284 942
N_2O	3 202 646	3 202 707		3 202 707
HFCs	950 212			950 212
PFCs	225 726			225 726
SF_6	60 716			60 716
Total Annex A sources[c]	**53 294 026**	**53 320 665**		**53 320 665**
Activities under Article 3, paragraph 3, for 2011				
3.3 Afforestation and reforestation on non-harvested land for 2011	–537 055			–537 055
3.3 Afforestation and reforestation on harvested land for 2011	–14 464			–14 464
3.3 Deforestation for 2011	2 473 521			2 473 521
Activities under Article 3, paragraph 4, for 2011[d]				
3.4 Forest management for 2011	–31 103 764			–31 103 764
3.4 Cropland management for 2011				
3.4 Cropland management for the base year				
3.4 Grazing land management for 2011				
3.4 Grazing land management for the base year				
3.4 Revegetation for 2011				
3.4 Revegetation for the base year				

Abbreviation: Annex A sources = source categories included in Annex A to the Kyoto Protocol.

[a] "Adjustment" is relevant only for Parties for which the expert review team has calculated one or more adjustment(s).

[b] "Final" includes revised estimates, if any, and/or adjustments, if any.

[c] The values for "Total Annex A sources" in the columns "As reported", "Revised estimates" and "Final" may not equal the sum of the values for the gases in those columns owing to rounding.

[d] Activities under Article 3, paragraph 4, are relevant only for Parties that elected one or more such activities.

Table 12
Information to be included in the compilation and accounting database in t CO_2 eq for 2010

	As reported	*Revised estimates*	*Adjustment*[a]	*Final*[b]
Annex A emissions for 2010				
CO_2	45 537 272	45 561 448		45 561 448
CH_4	4 420 453	4 422 383		4 422 383
N_2O	3 194 327	3 194 389		3 194 389
HFCs	914 444			914 444
PFCs	205 076			205 076
SF_6	75 382			75 382
Total Annex A sources[c]	**54 346 955**	**54 373 122**		**54 373 122**
Activities under Article 3, paragraph 3, for 2010				
3.3 Afforestation and reforestation on non-harvested land for 2010	–529 832			–529 832
3.3 Afforestation and reforestation on harvested land for 2010	23 853			23 853
3.3 Deforestation for 2010	2 386 401			2 386 401
Activities under Article 3, paragraph 4, for 2010[d]				
3.4 Forest management for 2010	–30 331 355			–30 331 355
3.4 Cropland management for 2010				
3.4 Cropland management for the base year				
3.4 Grazing land management for 2010				
3.4 Grazing land management for the base year				
3.4 Revegetation for 2010				
3.4 Revegetation for the base year				

Abbreviation: Annex A sources = source categories included in Annex A to the Kyoto Protocol.

[a] "Adjustment" is relevant only for Parties for which the expert review team has calculated one or more adjustment(s).

[b] "Final" includes revised estimates, if any, and/or adjustments, if any.

[c] The values for "Total Annex A sources" in the columns "As reported", "Revised estimates" and "Final" may not equal the sum of the values for the gases in those columns owing to rounding.

[d] Activities under Article 3, paragraph 4, are relevant only for Parties that elected one or more such activities.

Table 13
Information to be included in the compilation and accounting database in t CO_2 eq for 2009

	As reported	*Revised estimates*	*Adjustment*[a]	*Final*[b]
Annex A emissions for 2009				
CO_2	42 898 847	42 966 195		42 966 195
CH_4	4 401 503	4 403 593		4 403 593
N_2O	3 333 955	3 334 134		3 334 134
HFCs	736 469			736 469
PFCs	376 717			376 717
SF_6	61 455			61 455
Total Annex A sources[c]	**51 808 946**	**51 878 564**		**51 878 564**
Activities under Article 3, paragraph 3, for 2009				
3.3 Afforestation and reforestation on non-harvested land for 2009	–508 305			–508 305
3.3 Afforestation and reforestation on harvested land for 2009	23 853			23 853
3.3 Deforestation for 2009	2 232 667			2 232 667
Activities under Article 3, paragraph 4, for 2009[d]				
3.4 Forest management for 2009	–32 505 680			–32 505 680
3.4 Cropland management for 2009				
3.4 Cropland management for the base year				
3.4 Grazing land management for 2009				
3.4 Grazing land management for the base year				
3.4 Revegetation for 2009				
3.4 Revegetation for the base year				

Abbreviation: Annex A sources = source categories included in Annex A to the Kyoto Protocol.

[a] "Adjustment" is relevant only for Parties for which the expert review team has calculated one or more adjustment(s).

[b] "Final" includes revised estimates, if any, and/or adjustments, if any.

[c] The values for "Total Annex A sources" in the columns "As reported", "Revised estimates" and "Final" may not equal the sum of the values for the gases in those columns owing to rounding.

[d] Activities under Article 3, paragraph 4, are relevant only for Parties that elected one or more such activities.

Table 14
Information to be included in the compilation and accounting database in t CO_2 eq for 2008

	As reported	*Revised estimates*	*Adjustment*[a]	*Final*[b]
Annex A emissions for 2008				
CO_2	44 476 129	44 544 378		44 544 378
CH_4	4 481 240	4 483 215		4 483 215
N_2O	3 937 044	3 937 223		3 937 223
HFCs	691 954			691 954
PFCs	772 747			772 747
SF_6	65 395			65 395
Total Annex A sources[c]	**54 424 509**	**54 494 913**		**54 494 913**
Activities under Article 3, paragraph 3, for 2008				
3.3 Afforestation and reforestation on non-harvested land for 2008	–478 174			–478 174
3.3 Afforestation and reforestation on harvested land for 2008	23 853			23 853
3.3 Deforestation for 2008	2 095 583			2 095 583
Activities under Article 3, paragraph 4, for 2008[d]				
3.4 Forest management for 2008	–30 378 979			–30 378 979
3.4 Cropland management for 2008				
3.4 Cropland management for the base year				
3.4 Grazing land management for the base year				
3.4 Grazing land management for the base year				
3.4 Revegetation for 2008				
3.4 Revegetation for the base year				

Abbreviation: Annex A sources = source categories included in Annex A to the Kyoto Protocol.

[a] "Adjustment" is relevant only for Parties for which the expert review team has calculated one or more adjustment(s).

[b] "Final" includes revised estimates, if any, and/or adjustments, if any.

[c] The values for "Total Annex A sources" in the columns "As reported", "Revised estimates" and "Final" may not equal the sum of the values for the gases in those columns owing to rounding.

[d] Activities under Article 3, paragraph 4, are relevant only for Parties that elected one or more such activities.

Annex II

Documents and information used during the review

A. Reference documents

Intergovernmental Panel on Climate Change. *2006 IPCC Guidelines for National Greenhouse Gas Inventories*. Available at <http://www.ipcc-nggip.iges.or.jp/public/2006gl/index.html>.

Intergovernmental Panel on Climate Change. *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*. Available at <http://www.ipcc-nggip.iges.or.jp/public/gl/invs1.htm>.

Intergovernmental Panel on Climate Change. *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories*. Available at <http://www.ipcc-nggip.iges.or.jp/public/gp/english/>.

Intergovernmental Panel on Climate Change. *Good Practice Guidance for Land Use, Land-Use Change and Forestry*. Available at <http://www.ipcc-nggip.iges.or.jp/public/gpglulucf/gpglulucf.htm>.

"Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories". FCCC/SBSTA/2006/9. Available at <http://unfccc.int/resource/docs/2006/sbsta/eng/09.pdf>.

"Guidelines for the technical review of greenhouse gas inventories from Parties included in Annex I to the Convention". FCCC/CP/2002/8. Available at <http://unfccc.int/resource/docs/cop8/08.pdf>.

"Guidelines for national systems for the estimation of anthropogenic greenhouse gas emissions by sources and removals by sinks under Article 5, paragraph 1, of the Kyoto Protocol". Decision 19/CMP.1. Available at <http://unfccc.int/resource/docs/2005/cmp1/eng/08a03.pdf#page=14>.

"Guidelines for the preparation of the information required under Article 7 of the Kyoto Protocol". Decision 15/CMP.1. Available at <http://unfccc.int/resource/docs/2005/cmp1/eng/08a02.pdf#page=54>.

"Guidelines for review under Article 8 of the Kyoto Protocol". Decision 22/CMP.1. Available at <http://unfccc.int/resource/docs/2005/cmp1/eng/08a03.pdf#page=51>.

Status report for Norway 2014. Available at <http://unfccc.int/resource/docs/2014/asr/nor.pdf>.

Synthesis and assessment report on the greenhouse gas inventories submitted in 2014. Available at <http://unfccc.int/resource/webdocs/sai/2014.pdf>.

FCCC/ARR/2013/NOR. Report of the individual review of the annual submission of Norway submitted in 2013. Available at <http://unfccc.int/resource/docs/2014/arr/nor.pdf>.

Standard independent assessment report template, parts 1 and 2. Available at <http://unfccc.int/kyoto_protocol/registry_systems/independent_assessment_reports/items/4061.php>.

B. Additional information provided by the Party

Responses to questions during the review were received from Ms. Hege Haugland (Norwegian Environment Agency), including additional material on the methodology and assumptions used. The following documents[1] were also provided by Norway:

ICG. 1999. Materiastromanalyse av SF_6. *Beregning av Potensielt of Faktis Utslipp over Tid.* Statens forurensningstilsyn.

Karlengen IJ, Svihus B, Kjos NP and Harstad OM. 2012. *Husdyrgjødsel; Oppdatering av Mengder Gjødsel og Utskillelse av Nitrogen, Fosfor og Kalium. Sluttrapport.* Institutt for husdyr- og akvakulturvitenskap, Universitetet for miljø- og biovitenskap.

Mills JAN, Kebreab E, Yates CM, Crompton LA, Cammell SB, Dhanoa MS, Agnew RE and France J. 2003. Alternative approaches to predicting methane emissions from dairy cows. *Journal of Animal Science* 81:3141-3150. American Society of Animal Science.

Morken J. 2013. *Revision of the Norwegian Model for Estimating Methane Emissions from Manure Management.* IMT-Rapport Nr. 54/2013. Institut for Matematiske Realfag of Teknologi.

[1] Reproduced as received from the Party.

Annex III

Acronyms and abbreviations

AAU	assigned amount unit
AD	activity data
CER	certified emission reduction unit
C_3F_8	perfluoropropane
CH_4	methane
CMP	Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol
CO_2	carbon dioxide
CO_2 eq	carbon dioxide equivalent
CRF	common reporting format
dbh	diameter at breast height
DM	dry matter
DOC	degradable organic carbon
EF	emission factor
ERT	expert review team
EU ETS	European Union Emissions Trading System
F-gas	fluorinated gas
$Frac_{GASF}$	the fraction of synthetic fertilizer nitrogen applied to soils that volatilizes as ammonia and nitrogen oxides
FOD	first-order decay
GHG	greenhouse gas; unless indicated otherwise, GHG emissions are the sum of CO_2, CH_4, N_2O, HFCs, PFCs and SF_6 without GHG emissions and removals from LULUCF
HFCs	hydrofluorocarbons
IE	included elsewhere
IEA	International Energy Agency
IEF	implied emission factor
IPCC	Intergovernmental Panel on Climate Change
ITL	international transaction log
kg	kilogram (1 kg = 1,000 grams)
kha	kilohectare
KP-LULUCF	land use, land-use change and forestry emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol
LPG	liquefied petroleum gas
LULUCF	land use, land-use change and forestry
MCF	methane conversion factor
MDI	metered dose inhaler
N	nitrogen
N_2O	nitrous oxide
NA	not applicable
NE	not estimated
NH_3	ammonia
NIR	national inventory report
NO	not occurring
PFCs	perfluorocarbons
PJ	petajoule (1 PJ = 10^{15} joule)
QA/QC	quality assurance/quality control
RMU	removal unit
SEF	standard electronic format

SF_6	sulphur hexafluoride
SIAR	standard independent assessment report
SO_2	sulphur dioxide
SWDS	solid waste disposal site
TJ	terajoule (1 TJ = 10^{12} joule)
UNFCCC	United Nations Framework Convention on Climate Change
VS	volatile solids
Ym	methane conversion rate